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DIRECTOR

Swine Husbandry in Idaho

By
J. E. NORDBY, E. M. GILDOW AND W. M. BEESON

Grand Champion pen of barrows, Pacific International.
Well finished, high quality, 200 pound barrows.

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ANIMAL HUSBANDRY SECTION

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Swine Husbandry in Idaho

J. E. Nordby[1], E. M. Gildow[2], W. M. Beeson[3]

SWINE production is carried on for the most part in conjunction with other farm enterprises. Uniform success in the industry is based upon the efficient utilization of by-products, and upon foraging and "hogging-off" plans that are sufficiently flexible to make possible the production of pork with the smallest amount of grain and labor. The swine population is confined largely to the irrigated sections of southern Idaho, and wheat producing areas of northern Idaho (*Fig. 1 and Table* 1). Corn, wheat and barley, dairy by-products, soybeans, cull peas, cull potatoes, and an abundance of alfalfa are utilized in the irrigated sections. Successful ration combinations are made from these for all phases of swine production. Wheat, barley, oats, peas, cull potatoes, soybeans and corn in restricted areas, some dairy by-products, alfalfa and other forage crops are used in the northern part of the State.

The attitude of the producer toward the details involved in swine production is one of the most important elements which contributes

Table 1.—Swine on farms in Idaho by counties Jan. 1, 1935. U. S. Agricultural Census, 1935.

County	No. Hogs	County	No. Hogs
Ada	10,937	Gem	3,966
Adams	2,013	Gooding	6,466
Bannock	7,874	Idaho	17,802
Bear Lake	1,460	Jefferson	6,719
Benewah	1,428	Jerome	5,787
Bingham	10,141	Kootenai	1,673
Blaine	1,400	Latah	7,419
Boise	627	Lemhi	2,327
Bonner	1,131	Lewis	5,913
Bonneville	11,720	Lincoln	3,004
Boundary	1,530	Madison	4,303
Butte	1,950	Minidoka	3,219
Camas	403	Nez Perce	8,545
Canyon	18,735	Oneida	1,756
Caribou	684	Owyhee	2,876
Cassia	7,269	Payette	4,761
Clark	289	Power	1,410
Clearwater	1,352	Shoshone	103
Custer	715	Teton	1,373
Elmore	1,106	Twin Falls	9,671
Franklin	2,767	Valley	627
Freemont	5,566	Washington	5,513
		Total	196,330

[1] Resigned March 1, 1938.
[2] Veterinarian, Idaho Agricultural Experiment Station.
[3] Associate Animal Husbandman, Idaho Agricultural Experiment Station.

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Revised February 1, 1939, by E. M. Gildow and W. M. Beeson.

to success or failure in the enterprise. His livestock-mindedness is an asset that contributes to stability if hog price and production costs are not in tune. The adaptability of hogs to each individual farm is determined by a number of factors. The size of the farm, the availability of suitable forage crops, the possibility of growing crops to be

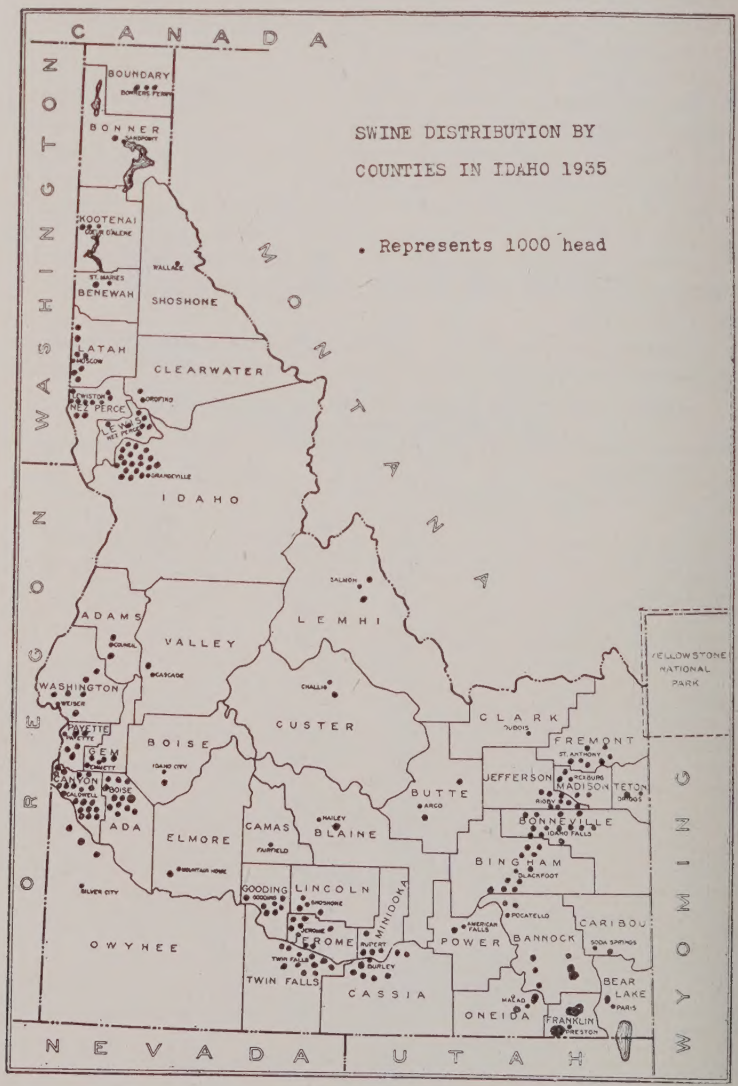

Figure 1.—Swine are found in largest numbers on the irrigated projects in the southern and throughout the wheat producing areas in the northern end of the State.

"hogged-off," and the amount of crop residues that may be available from year to year are important in determining how many hogs to keep. The number may vary some from year to year. In wheat producing areas, where corn is not produced, it is well to keep in mind that the price of hogs does not always vary with the price of wheat. The correlation between the price of wheat and hogs is much less in evidence than it is between corn and hogs. One should work into the business of swine production gradually as this method makes possible a better understanding of the details which solves in a large measure the question of numbers for each farm.

Swine production contributes to the stability of agricultural prosperity of Idaho in the proportion in which farmers realize the necessity of producing some hogs on each farm adapted to swine production, and not by concentrating the production on a few farms. The former method identifies the swine production enterprise as an adjunct to the general farm production policy, while the latter practice may make it necessary to farm for the sake of the swine enterprise. This often proves disturbing when crop prices are not necessarily correlated with prices of market hogs.

Breeding and Selection

Type

Type in swine is recognized as a combination of those characteristics which contribute to efficiency in the cost of production, and to adaptability in pork trade requirements. Type in swine is determined almost entirely by the producer of market hogs, the breeder of purebred swine, and by the consumer of pork products. The consumer, no doubt, has had a major part in this program and exerts his influence directly through his exacting demands at the meat counter. These demands are reflected to the producer of market hogs through the retailer and packer who pay premiums for hogs that are acceptable in weight, quality and shape, and discount heavily coarse, overweight hogs. The growing demand for leaner, more tender, juicy, and smaller cuts with less waste has made it necessary for the breeder of purebred swine to supply a type which makes it possible for the producer of market hogs to breed and develop individuals in which there is the closest possible coordination in the characteristics which influence cost of production, efficiency, and consumers' demands.

The breeder of purebred swine is vitally interested in the inherent ability of his hogs to grow rapidly, to be straight and sound in the feet and legs, strong in the back and to have the required depth, thickness and smoothness of body, quality and style that make them wear and sell well. These rigid requirements will make it possible for the commercial producer to put on the market at six months of age 200-pound firmly finished barrows that have long, deep and smooth sides; thick, full and smooth hams; a moderately wide and gracefully carried back; deep and smooth shoulders; and sound feet and legs.

When all of these characteristics are combined in a well-balanced individual with an abundance of quality, the exacting demand of the consumer is likely to be satisfied (*See Fig. 2*).

Selecting a Breed

Personal preference on the part of the breeder is one of the important elements in selecting a breed. He should try to satisfy this desire as far as possible. One usually gets the best results with the breed one likes. Results in the feedlot do not bring out much difference be-

Figure 2.—Chester White barrow. Grand Champion, International Livestock Exposition, Chicago. Owned by Purdue University, Lafayette, Indiana.

tween breed when the individuals are selected with equal care and given the same attention. Prolific strains that are hardy and have good rustling and feeding qualities should be selected in any breed. The ability of the sow to mother her young is fundamentally important.

Grading Up the Herd

Uniformity in feeder hogs can be encouraged by constantly selecting purebred sires from one breed. When this plan is followed for a few years, the grade pigs will be virtually as uniform as good purebreds in type and color. Boars selected for this purpose should come from herds where there is evidence of constructive effort to produce a good uniform type.

Selecting the Breeding Herd

Experimental data have justified the conclusion that the time and cost required to produce a 200-pound market hog decrease as the

percentage of pure breeding increases. Obviously, therefore, it is desirable to use very high grade or purebred sows for foundation herds. The price of purebred sows, that are acceptable in type, is in line with commercial values under normal conditions. The breeder of purebred swine is constantly making efforts to maintain a uniform and efficient type in his herd. Sows selected from such a herd will usually prove to be more satisfactory for the production of market hogs than will grade sows which do not have such a desirable selective heritage to their credit.

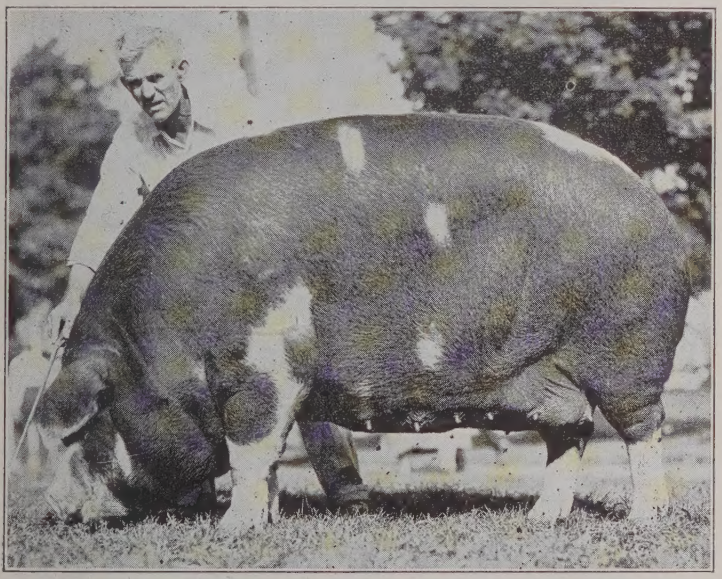

Figure 3.—Spotted Poland China sow. Grand Champion, Indiana State Fair.

The Sow. A brood sow should have considerable length and a uniform balance of length in neck, shoulder, back, and rump. The width of the body should be medium and uniform throughout the entire length. The depth should be emphasized, for upon it depends, in large measure, the usefulness of the sow as a producer and the ability of her pigs to be efficient feeders. Smoothness should be evident in the shoulders, sides and hams, for this is one of the characteristics that contribute to quality. The shoulders should be deep and laid closely at the top. The ham must be deep, full and smooth. The back should have evidence of strength and be gracefully carried in a uniform arch. A deep, long, and smooth side is necessary. The joints should be neat, and free from coarseness and the shoulder free from excessive fullness. The width and length of the head must balance. Too much length is undesirable for it is usually associated with a narrow and pointed snout. The ears should be moderate in

size, and lightly carried. The eyes should be reasonably prominent. Wrinkles in the forehead of a sow often grow so large that the folds close the eyelids. Neatness and quality about the head are therefore imperative. Sound feet, and legs set squarely under the body are de-

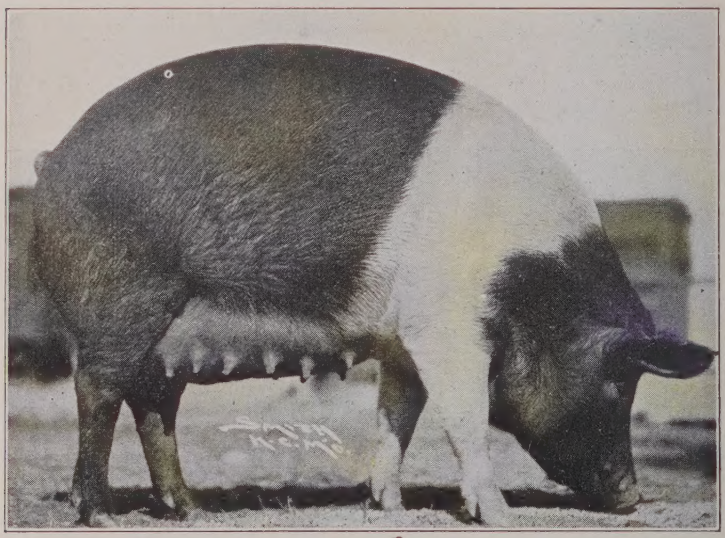

Figure 4.—Hampshire sow, Pay Girl. Grand Champion at Missouri, Wisconsin, Kentucky, Tennessee, Oklahoma and Texas State Fairs 1934. Owned by Sand Springs Home, Sand Springs, Oklahoma.

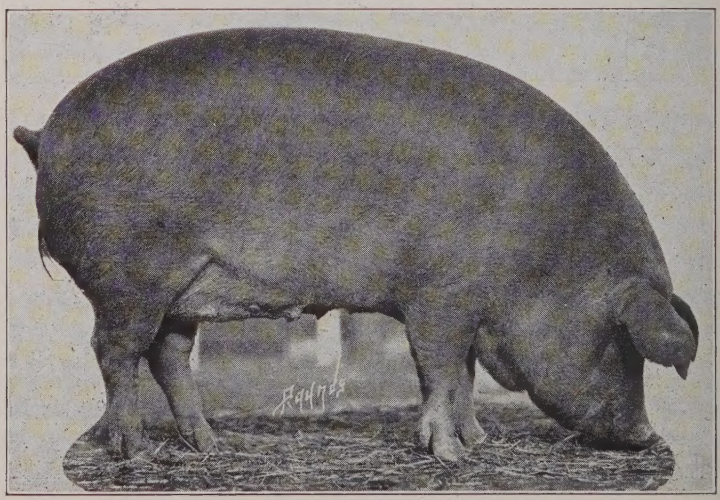

Figure 5.—Duroc sow. Grand Champion, Pacific International Livestock Exposition, and a dam of champions.

sirable. A brood sow should have all of these characteristics properly coordinated in a nicely balanced and breedy individual (*See Fig.* 3).

The tendency to be vicious, nervous and irritable may be inherited. A sow having such a tendency should be eliminated from the herd. The test of a good sow lies in her ability to produce pigs at a profit. The sow should have at least ten normal properly spaced

Figure 6.—A useful sow should be equipped with at least six good teats in each of the two rows. **A,** good underline; **B,** sow with three blind teats on each side and in the middle of the row; **C,** the same sow after nursing a small litter for four weeks. Three teats on each side functioned. (See text for inheritance of this defect.)

teats. The tendency to produce "blind" teats appears hereditary, according to data secured at this station. When the end of the teat is telescoped back into the body of the teat it is spoken of as a "blind" teat (*See Fig. 6*).

The Boar. The boar should always be a creditable purebred individual. His initial cost is very little more than the cost of a grade. The use of purebred boars is so general that it is rather odd to speak of grade boars. A boar with a creditable conformation is more often a good sire than is a boar inferior in individuality. All purebred boars are not good boars.

A boar should, in general, be characterized by ruggedness and masculinity. These should not be emphasized, however, at the expense of quality. Masculinity must not be confused with coarseness and viciousness. A boar may be very high in quality and still be rugged

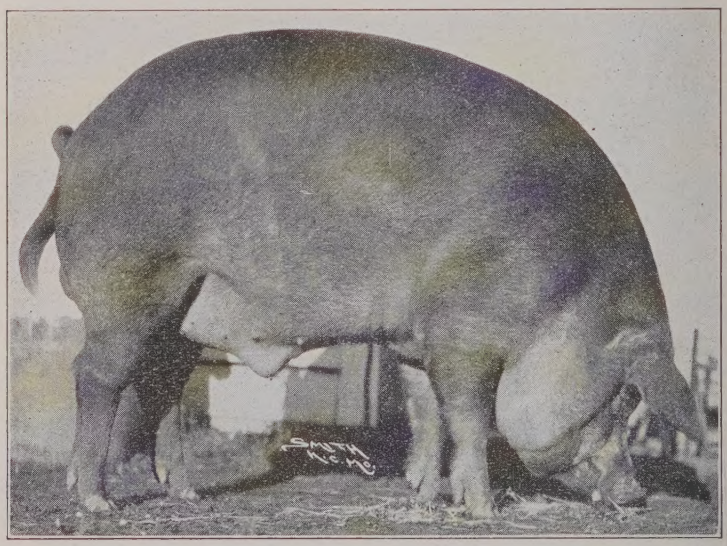

Figure 7.—Duroc boar, New Era. Grand Champion, National Swine Show, 1935. Owned by F. E. Shrock & Sons, Marion, Indiana.

and masculine. Thick, wide and coarse shoulders are often erroneously associated with masculinity in a boar. They are too often the result of hereditary influences and usually will be transmitted to the offspring. It is impossible for a coarse-shouldered pig to develop into a smooth barrow.

Size is difficult to maintain in swine under the conditions that usually prevail in commercial production. It is advisable, therefore, to use a boar that has indications of a large growth heritage. The most economical gains are made when pigs are growing. Some advantage is offered, therefore, by using a boar whose pigs will not slow up their growth too soon.

A boar should have ample length that shows the proper balance in neck, shoulder, back and rump; shortness in the neck and back must be emphasized. The rump should be long and well developed, and the entire top line heavily muscled and supported in a smooth and uniform arch. The loin must be full and smooth. Thin-loined boars often weave when walking. Superior sides are invariably deep with the underline neatly carried. The hams must be smooth, deep, wide, and nicely balanced. The shoulders should be deep, neatly laid at the top and should not carry too heavy a shield. The shield is of service in combat only, hence, is of little use under our domesticated conditions. The bone should be large, but not coarse. The legs must be properly placed, making it possible for the boar to walk straight. The walk of a boar is important and he cannot walk straight if all parts of the body, including the feet and legs, do not properly coordinate. A boar with a scrotal hernia or with only one testicle in the scrotum should not be selected as a sire as both these defects apparently are inherited.

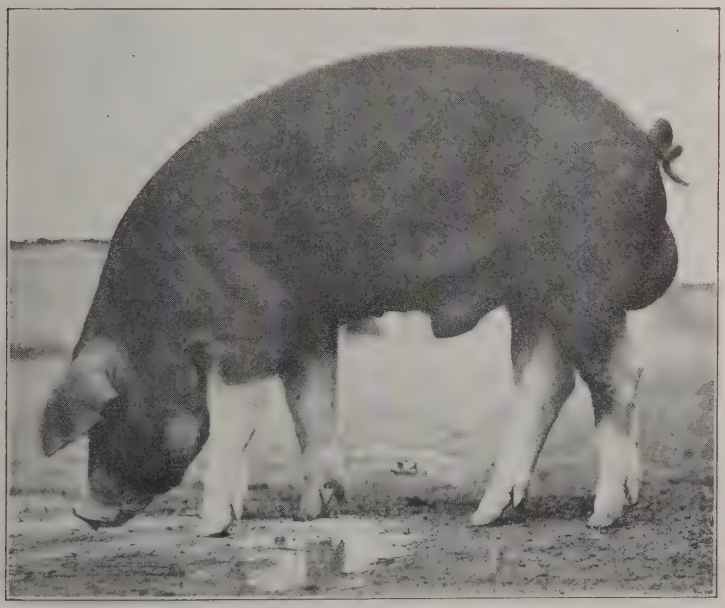

Figure 8.—Poland China boar, Gladstone. Junior Champion, Iowa State Fair, 1935. Owned by Lee Seryen & Sons, Prairie City, Illinois.

Feeding

Food Nutrients for Swine

The value of a feed is determined primarily by the amount of digestible nutrients it contains. These nutrients are proteins, carbo-

Table 2.—Composition of some common feeds*

KIND OF FEED	Total dry matter in 100 lbs. of feed	Digestible nutrients in 100 pounds of feed				Nutritive ratio of feeds†
		Crude protein	Carbohydrates	Fat	Total	
Concentrates						
Barley (Common)	90.7	9.0	66.8	1.6	79.4	1: 7.8
Corn (Dent)	89.5	7.5	67.8	4.6	85.7	1:10.4
Oats	90.8	9.7	52.1	3.8	70.4	1: 6.3
Peas (Field)	90.8	19.0	55.8	0.6	76.2	1: 3.0
Wheat (all analyses)	89.8	9.2	67.5	1.5	80.1	1: 7.7
Beans (Navy)	86.6	18.8	51.3	0.8	71.9	1: 2.8
Fish Meal	89.5	40.1	.....	8.3	58.8	1: 0.5
Linseed Oil Meal (O. P.)	90.9	30.2	32.6	6.7	77.9	1: 1.6
Soybean seed	90.1	33.2	24.7	16.1	94.1	1: 1.8
Tankage (60% protein)	92.1	56.2	.....	7.2	71.4	1: 0.3
Tankage (Below 40%)	90.9	34.3	.....	14.1	66.0	1: 0.9
Wheat bran (all analyses)	89.9	12.5	41.6	3.0	60.9	1: 3.9
Wheat Middlings (flour)	89.3	15.7	52.8	4.3	78.2	1: 4.0
Wheat Middlings Standard (shorts)	89.5	13.4	46.2	4.3	69.3	1: 4.2
Milk and Milk Products						
Cow's milk	13.6	3.3	4.8	3.6	16.2	1: 3.9
Buttermilk	9.4	3.4	4.9	0.1	8.4	1: 1.5
Buttermilk (dried)	88.3	29.3	41.0	6.2	84.2	1: 1.9
Buttermilk (semi-solid)	35.0	12.6	16.7	3.5	36.2	1: 1.9
Skim milk (centrifugal)	9.9	3.6	5.1	0.2	9.1	1: 1.5
Skim milk (dried)	95.5	32.5	49.9	1.9	86.7	1: 1.7
Whey	6.6	0.8	4.7	0.3	6.2	1: 6.8
Dried Roughages						
Alfalfa hay (all analyses)	91.4	10.6	39.0	0.9	51.6	1: 3.9
Alfalfa leaves	93.4	17.3	35.9	3.0	60.0	1: 2.5
Roots and Tubers						
Beet, sugar	16.4	1.2	12.6	0.1	14.0	1:10.7
Carrot	11.7	1.0	9.1	0.2	10.6	1: 9.6
Potato	21.2	1.1	15.8	0.1	17.1	1:14.5
Green Legumes						
Alfalfa (before bloom)	19.9	3.5	7.5	0.3	11.7	1: 2.3
Peas (Canadian field)	16.6	2.9	7.1	0.3	10.7	1: 2.7
Soybean (in bloom)	20.8	3.0	8.5	0.3	12.2	1: 3.1
Green Fodder from the Smaller Cereals						
Barley fodder	23.2	2.3	11.5	0.4	14.7	1: 5.4
Oat fodder (8 in. high)	13.0	3.4	4.1	0.5	8.6	1: 1.5
Rye fodder (5 in. high)	18.1	5.1	6.2	0.7	12.9	1: 1.5
Wheat fodder (5 in. high)	24.2	5.1	10.3	0.5	16.5	1: 2.2
Miscellaneous						
Apple	18.2	0.4	15.6	0.2	16.4	1:40.0
Apple pomace	23.3	1.2	15.6	0.8	18.6	1:14.5
Pumpkin (field)	8.3	1.1	4.5	0.5	6.7	1: 5.1
Rape	16.7	2.6	10.0	0.3	13.3	1: 4.1

*From *Feeds and Feeding*, by F. B. Morrison, Morrison Publishing Company, Ithaca, New York.

†This ratio is obtained by adding to the carbohydrates 2.25 times the amount of fat and dividing the sum by the amount of crude digestible protein.

The following recommendation for nutritive ratios of the grain feed are made merely as a general guide and are approximately correct when 50 per cent of the protein supplements used are from an animal source:

	Nutritive Ratio
Growing pigs on a legume pasture	1:6.5
Fattening pigs in a dry lot	1:5.5
Brood sows in winter, getting alfalfa hay	1:6.0
Brood sows during suckling period on legume pasture	1:6.5

hydrates, fats, minerals, and vitamins. Proteins are necessary for developing muscle. Carbohydrates and fats are essential for providing heat and energy for the body. Minerals contribute to the growth of the bony structure of the body, and to the performance of important body functions. Vitamins are necessary for growth, reproduction, and for the animal's vitality in general.

Inasmuch as the feed cost of producing varies from 75 to 85 per cent of the total cost, it is obvious that one should give much attention to feeds. Practically all the feeds used should be home-grown. Purchased feeds should contain as large a percentage as possible of the particular element that is lacking in the home-grown feeds. This element is usually protein. It should also be an animal protein. Some ready mixed feeds may run rather high in protein but the bulk of it may be vegetable proteins that are found in home-grown feeds.

Home-grown feeds vary considerably in their nutritive value. These variations are shown in Table 2. In this table are found differences in the protein, carbohydrate and fat content of a number of feeds

Figure 9.—Duroc gilt, Queen Anne. Junior Champion, National Swine Show, 1938. Owned by Schubert Bros., Woodbine, Illinois.

that are used in swine production. In the last column to the right is found the nutritive ratio of the feeds. Since feeds are usually compared on the basis of their nutritive ratio it is well to know just what it represents. In the table we find the nutritive ratio of barley to be 1 : 7.8 which means that if we give the value of 1 to the amount of digestible crude protein (9.0) in 100 pounds of barley the value of (66.8) plus the value of the fat (1.6) would be 7.8. The carbohydrates and fats are combined because they serve essentially the same purpose. One pound of fat, however, has a value equal to 2.25 pounds of carbohydrates. In order to combine these two, therefore, they must be reduced to a common basis. This is done by multiplying 1.6 (per cent of fat in barley) by 2.25 which gives 3.6. When we add 3.6 (the carbohydrate equivalent of 1.6 pounds of fat) to 66.8, the carbohydrates in barley, we get 70.4. When we divide 70.4 by 9.0

(crude protein) we find that 70.4 is 7.8 times as large as 9.0. The nutritive ratio is, therefore, expressed as 1 to 7.8.

Nutritive Ratio of Mixtures. It is not quite so simple to find the nutritive ratio of a combination of feeds, at least when they contribute different amounts of the mixture. When any feed in a mixture makes up less than 100 pounds, the figures for the digestible protein, carbohydrates and fat in the table, which are given for 100 pounds of feed, must be divided by 100 and then multiplied by the pounds of this feed present in the mixture. Find for example, the nutritive ratio of the following mixture:

	Crude Protein	Carbohydrates	Fat
Barley, 100 lbs.	9.00	66.80	1.60
Wheat, 100 lbs.	9.20	67.50	1.50
Tankage. 16 lbs.	8.99		1.15
Alfalfa leaves, 10 lbs.	1.73	3.59	.30
	28.92	137.89	4.55

Applying the formula: Carbohydrates plus 2.25 times the fat, divided by the crude protein or 137.89 plus (4.55 x 2.25) ÷ 28.92 or 5.1 Therefore, the nutritive ratio o fthis feed ration is 1 : 5.1.

Quality of Nutrients in Feed

There is considerable variation in the quality of nutrients in feed that is not recognized in Table 2. This is stressed more in connection with the proteins, minerals and vitamins. The amount of protein may be the same in two feeds, yet the proteins in one may be far less complete than the proteins in the other. Proteins are made up of many different parts, some of which are essential to growth and others necessary for maintenance. Those elements in the proteins necessary for growth for example, are largely absent in some feeds even though these feeds may be high in total proteins. One should, therefore, make up a ration of different kinds of feeds so as to more nearly insure a balanced supply of proteins. Proteins from an animal source, such as tankage and skim milk are important for this reason.

Grains

The large variety of feeding stuffs produced in Idaho makes it comparatively convenient to make up rations that are admirably adapted for the production of pork.

Corn. Corn matures satisfactorily in a number of the irrigated sections in the State, and is also produced in limited sections in the Clearwater drainage area of northern Idaho. Much of the corn produced in the State is fed to swine. Corn that is properly matured here compares favorably with eastern corn as a feed for swine. A protein supplement should be fed with corn. When the pigs are on a legume pasture and corn, it is helpful to feed 1 pound of skim milk for each pound of corn, or give them 5 pounds of tankage with each 100 pounds of corn.

Barley. Barley is used extensively in pork production in Idaho. Its feeding value is about 8 per cent less than the feeding value of No. 2 corn (*Table* 3). It should be ground or rolled for best results. Eighty-five pound fall pigs produced 100 pounds of gain with 306 pounds of barley, 131 pounds of peas and 25 pounds of alfalfa hay, gaining at the rate of 1.2 pounds per day. In other tests at this station; 100 pounds of pork have been produced in the dry lot by pigs weighing 84 pounds at the beginning of the test with 430 pounds of barley,

Table 3.—Comparative value of fattening feeds for hogs when all feeds noted are properly supplemented.
(Ground barley used as a standard for comparison.)

Feed	Approximate comparative value of 100 pounds when ground barley is worth								
	Per cent*	Dollars							
Ground barley	100	$0.60	$0.70	$0.80	$0.90	$1.00	$1.10	$1.20	$1.30	$1.40
Ground corn	109	0.65	0.76	0.87	0.98	1.09	1.20	1.31	1.42	1.53
Ground wheat	114	0.68	0.80	0.91	1.03	1.14	1.25	1.37	1.48	1.60
Ground oats	82†	0.49	0.57	0.66	0.74	0.82	0.90	0.98	1.07	1.15
Wheat middlings	90†	0.54	0.63	0.72	0.81	0.90	0.99	1.08	1.17	1.26

*Barley is used as a standard for comparison. When ground barley is given a value of 100 per cent, corn has a value of 109 per cent and so on for the other feeds. The price comparisons are based upon the values in the per cent column when barley has the price value indicated. There is obviously some variation in actual feeding operations from the comparative per cent values assigned. These values, however, will serve as an approximate guide.

†Value of ground oats when fed not to exceed one-third of the grain ration Wheat middlings are, as a rule, not fed as a fattening ration.

20 pounds of 60 per cent digester tankage, and 20 pounds of alfalfa leaves. In the same trials it required 580 pounds of barley when fed alone to produce 100 pounds of gain, and when 60 per cent digester tankage was fed with barley, it required 446 pounds of barley and 34 pounds of digester tankage. The pigs fed barley alone gained .84 pounds each day, those fed tankage and barley 1.3 pounds per day, and those fed alfalfa leaves,, barley, and tankage 1.45 pounds per day. Another lot gained 100 pounds on 330 pounds of barley and 142 pounds of peas at the rate of 1.08 pounds per day.

Wheat. It is not good practice to feed wheat alone. It should be fed ground. Soaking ground wheat scarcely pays for the work involved. It is not profitable to feed whole wheat either soaked or dry. Grinding wheat increases its value from 15 to 20 per cent over whole wheat, and increases the daily gains in hogs from 10 to 15 per cent. Wheat when ground is worth from 3 to 5 per cent more than No. 2 corn. Spring pigs weighing 52 pounds gained, on a full grain feed, 1.45 pounds per day on alfafa forage, and required 348 pounds of wheat and 27 pounds of tankage for each 100 pounds gain. Another lot gained on a limited ration 1.28 pounds per day on alfalfa forage requiring 338 pounds of wheat and 22 pounds of tankage. Approximately 550 pounds of wheat are required to produce 100 pounds of gain in dry lot feeding of fall pigs when wheat alone is fed. When one pound of tankage, fish meal or its equivalent in skim milk, etc., is fed with 12 tc 14 parts of wheat, the wheat requirement for 100 pounds of gain is about 425 pounds. The daily gains also will be larger when a protein supplement is fed.

Satisfactory gains have been secured at this station when wheat has been supplemented with cracked Canadian field peas. One-hundred-fifty pound fall pigs gained 1.83 pounds per day for 42 days, requiring 396 pounds of wheat and 46 pounds of cracked peas for each 100 pounds of gain. Wheat may be fed to all classes of swine when properly balanced with protein supplements. It is not desirable to supplement wheat with only wheat by-products.

Peas. When peas are harvested they are usually too expensive to feed to hogs. Pigs frequently go off feed and make unsatisfactory gains when fed peas alone in the dry lot. In tests at this station with 68-pound pigs fed cracked peas, gains of .76 pounds per day were made for 175 days requiring 445 pounds of peas for each 100 pounds of gain. Where peas constitute the only ration for brood sows during the period of pregnancy, the pigs farrowed by these sows averaged, in tests at this station, one-half pound less and were less thrifty than pigs farrowed by sows fed barley, cracked peas, and alfalfa hay.

Pea Screenings. Pea screenings can be utilized to advantage. They vary so much in composition, however, that it is difficult to give pea screenings even an approximate value.

Oats. The oats produced in this climate are usually very plump, and it is very doubtful if any grain is superior to oats for growing pigs. Oats are likewise very useful for brood sows during pregnancy and as part of the ration during the suckling period.

Oats should not comprise more than one-fourth to one-third of the ration for finishing hogs; they must be ground for best results. If oats are selling for a higher price than other grains, less oats may be fed. It has not proven generally satisfactory in Idaho to feed oats in large quantities in feed lot rations (*Table* 3).

Soybeans. A few areas in the State are well adapted to the production of soybeans. Corn and soybeans require about the same climatic conditions for the best yields. Soybeans are high in protein and low-melting oil and should not constitute the entire ration. A large proportion of soybeans in a ration will result in soft pork. It is likely that soybeans will be used primarily as a forage crop in Idaho as they are ready to be pastured when other green feed is scarce. When mature soybeans are hogged-off, the hogs should be fed grain or allowed the run of a cornfield. They are not so palatable for small pigs as for pigs that weigh 100 pounds or more. Soybeans may be fed as a protein supplement up to 10 or 12 per cent of the ration. Other supplements should also be used. Soybeans may also be used for brood sows or for developing breeding hogs.

Beans. When cull table beans are cooked in water to which a small amount of salt has been added, they are satisfactory for swine. When cooked, beans are fed in equal amounts with one of the standard concentrate feeds such as barley, corn or wheat it will require about 425 pounds of the mixture to produce 100 pounds of gain. When beans are fed alone the daily gains are not so satisfactory as when beans

are combined with a grain feed. Beans should be cooked before they are fed to swine.

Forage Crops

The successful production of swine in Idaho depends in large part upon the utilization of forage crops. Forage crops not only supply comparatively cheap feed, but they keep the hogs in better physical condition and are indispensable in following sanitation requirements.

When hogs below 200 pounds in weight are on a full grain ration and alfalfa forage, the forage will replace from 15 to 20 per cent of the grain requirements. The forage will replace more grain if the hogs are getting less than a full feed of grain. Mature brood sows that are not suckling pigs will, as a rule, stay in good shape on alfalfa forage when fed even less than one pound of grain per day for each 100 pounds of live weight.

It is advisable, in choosing forage crops, to select those that are adapted to local soil and climatic conditions. Forage crops should also be selected on the basis of cost of production, palatability, yield, succulence, length of grazing period, and ability to endure tramping. They should, when possible, be leguminous in character.

Alfalfa. Alfalfa is the most desirable forage crop for swine. In common with other forage crops, it grows better when it is not pastured too closely. It is a good policy to provide enough acreage so that a crop of hay may be removed during the forage season.

Bluegrass and Other Perennial Grasses. Bluegrass, when properly managed, is used with some success in the irrigated sections of the State. It cannot compete successfully with the legumes in the non-irrigated sections.

Other perennial grasses are not so desirable, as they lack the palatability that is so characteristic of the legumes.

Rye. The value of rye lies in its ability to furnish succulence when the other forage crops are scarce. It does not supply a large amount of forage, but it is utilized to advantage late in the fall and early in the spring.

Wheat. Winter wheat seeded in the spring may be used as pasture the first summer, primarily in areas outside the alfalfa producing sections. It is often foraged the second year until it begins to joint. It should never be grazed closely. Twelve pigs weighing 46 pounds each were turned into a one-acre field of winter wheat May 20, at this station. The wheat had been seeded in October of the previous year. The pigs were fed 2 pounds of grain per day for each 100 pounds of live weight, or about one-half as much as they would eat, and gained .81 pound a day for 62 days. They required 257 pounds of wheat and 13 pounds of tankage (60 per cent) for each 100 pounds of gain. A similar lot for the same period on one acre of wheat gained 1.03 pounds per day on a full grain ration of wheat and tankage and required 358 pounds of wheat and 18.5 pounds of tankage

for each 100 pounds of gain. Some of the wheat in these lots matured and was hogged-off by the pigs during the test.

Oats. Oats serve only as an emergency forage crop. They are used, however, more satisfactorily in combination with peas. A mixture of 40 pounds of oats and 50 pounds of peas per acre under favorable conditions will produce a fairly satisfactory short period forage crop.

Peas. Peas alone are used most successfully as a hogging-off crop. The yield of forage is comparatively small as peas do not do so well when pigs are constantly picking at them, often pulling up entire plants. As a forage they are successfully used in combination with oats. (*See oats above*). Peas have no significant advantage over alfalfa.

Soybeans. Hogs are usually turned into soybeans about a week or ten days after they are in full bloom if one desires to take advantage of the leaves. Soybeans should be grazed lightly at this stage of development if one is interested in having a large per cent of the pods fill.

Hogging-Off Crops

Corn. Quite a large percentage of the corn that is fed to swine in Idaho is hogged-off. Four thousand three hundred acres were harvested by hogs in Idaho in 1929. When hogging-off corn, the hogs should be allowed access to alfalfa pasture or some other green feed. The daily gains may be increased if a small allowance of wheat middlings or tankage is supplied.

Peas. An average of 406 pounds of pork per acre of peas hogged-off has been produced in tests over a period of years at this station. The yields of pork per acre ranged from 250 to 650 pounds. Pigs that are allowed one-half ration of ground barley when they are hogging-off peas gain more rapidly and the carrying capacity of the pea acreage is increased.

Under irrigated conditions in this State a demonstration with 77 pigs turned into an 11-acre field of peas resulted in daily gains of 1.4 pounds per day, for 94 days, and a total production of 824.8 pounds of pork per acre. The pigs that are being finished for market should not be required to clean the fields. This can be done by the stocker pigs and breeding herd.

A pea variety mixture for hogging-off is good in theory only if there is a difference in the time of maturity of the varieties in the mixture. If the hogs are turned in when the earliest variety is ready, the later varieties will be tramped, the effect of which reduces significantly their yield. It is a better practice to use the varieties in separate lots and turn in when each has reached the proper stage of maturity. Peas are ready to be hogged-off when the first pods begin to ripen. Early varieties afford a greater possibility of finishing the hogs in the field for the early market.

Unthreshed pea vines are often harvested for winter feeding. This eliminates the expense of threshing. The vines should be stored under shelter. They should be fed on feeding floors during wet weather.

Wheat. Wheat may be hogged-off with success in dry seasons. The hogs are turned in about as early as the wheat is ready to be cut with the binder. This method appears to be successful enough to merit consideration. Pigs which have been full-fed during the summer do not adapt themselves so readily to hogging-off wheat as those that have had limited rations on forage. Obviously, smooth headed varieties of wheat are more suitable for hogging-off.

Figure 10.—A good job of hogging-off wheat.

Soybeans. Soybeans may be hogged-off in conjunction with standing corn. Grain should be fed when hogs are on soybeans, as they are too high in protein and low-melting oil to be fed alone. The grain may be supplied in a self-feeder or be hand fed.

Protein Supplements

As a general rule pigs that have access to a good legume pasture, preferably alfalfa or clover, when on full feed, require only about one-half as much concentrated protein supplement as they require in the dry lot. If they are not on full feed, they will consume more forage and will require only from one-third to one-half the amount of protein supplement consumed by those in the dry lot. The larger and more mature the hog, the more forage it will consume, consequently less protein supplement will be required. Pigs that are developed to market weight while on a good legume forage require from 15 to 20 per cent less grain for each 100 pounds of gain than when in the dry lot. Experiment station workers in general favor protein supplements made up from two or more sources, at least one of which should be from an animal source. Such a plan usually increases the palatability of a ration, encourages greater consumption and more rapid gains.

More rapid gains as well as more economical gains result when the supplements are properly used with grain. The grains are deficient in proteins, minerals, and vitamins—elements which can in large part be supplied by the use of leguminous forages. For best results, protein supplements from an animal source, such as the dairy by-products, tankage and fish meal should be used, as they supply the elements in which the grains are deficient.

Skim Milk. Skim milk is very valuable in all phases of swine production. The protein in milk is complete and easily digested. In pasture, pigs utilize skim milk to good advantage if they are fed 1 pound for each pound of grain when on a full grain ration. In the dry lot, 2 pounds may be fed for each pound of grain. The value of skim milk in the ration decreases when it is fed in larger quantities. If fed in the amounts indicated, it will require from 400 to 450 pounds of skim milk to replace 100 pounds of grain. When skim milk is available on the farm it may, of course, be fed in larger quantities.

Whey. Whey has a little less than one-half the value of skim milk. Therefore, the cost of handling per unit of protein is materially increased over the cost of handling skim milk. The protein content of whey is low, hence it is difficult to balance the grain ration when it is fed as the only supplement.

Buttermilk. Buttermilk has a value comparable with skim milk, and may be fed in the same amounts. Unless the cream from which creamery buttermilk is made has been pasteurized, it should be heated to 180° F. to help avoid the spreading of diseases, especially tuberculosis.

Dried Buttermilk. Dried buttermilk is a very satisfactory feed for all classes of swine. As a rule it contains less than 40 per cent protein and on the basis of experimental tests it should sell for a little less than 60 per cent digester tankage when used as a swine feed.

Semi-solid Buttermilk. This product contains only from 13 to 15 per cent protein and a little over 60 per cent water. On the average, its value is approximately two-thirds that of 60 per cent tankage. To have this value, however, it must be fed sparingly with other cheaper supplements that make up the bulk of the protein supplements such as tankage.

Tankage. The meat packing industry manufactures different grades of by-products in the form of tankage, often referred to as meat meal, that are valuable in pork production. The per cent of protein in the various grades of tankage should not constitute the sole basis of making comparisons as some of the lower grades are higher in fat. Since tankage is purchased primarily for its protein content, it is generally advisable to buy the grades that contain the highest per cent of protein. One part of tankage and 10 parts of corn or 12 to 14 parts of wheat or barley will, as a rule, give excellent results when fed to hogs in the dry lot. The tankage may be reduced to about one-third or one-half this amount when the hogs have access to high quality alfalfa hay. Investigations point favorably to the use of more than one protein supplement in a ration.

Fish Meal. The composition of fish meal is similar to that of digester tankage. Some tests indicate that high-grade fish meal is about equal to tankage, and others that it is slightly superior to tankage. It can be fed in the same proportion as tankage.

Wheat By-products. Wheat by-products commonly available are bran, shorts, and flour middlings. They vary considerably in composition. In some cases bran is run with the shorts and at times ground screenings may also be included, especially with the middlings. It is difficult, therefore, to develop a definite guide for intelligently selecting one or the other of these by-products.

The by-products of wheat are used most satisfactorily in conjunction with other supplements richer in protein, as a basis for slops. Wheat middlings, when substituted for the grain protein of a ration, are worth about 20 per cent less than wheat when fed to swine in the feed lot. While these by-products are high in protein, they do not supplement the proteins in grains satisfactorily, unless the pigs are on legume pasture and are also receiving a protein supplement in the form of tankage, fish meal, or dairy by-products. Wheat bran is too bulky and laxative for little pigs, but is useful for brood sows in limited quantities before farrowing. After farrowing, shorts or middlings are more commonly used. Wheat by-products should not be used alone as supplements for wheat.

The value of supplements is generally calculated on the basis of the amount of grain which they will replace in producing 100 pounds of pork and by the increased rate of daily gain in the hogs. One hundred pounds of tankage will replace from 400 to 450 pounds of grain when digester tankage is fed to the extent of balancing wheat or barley in the dry lot for fattening hogs. It may prove advisable to use less tankage unless one is interested in the maximum rate of gain and if 400 to 450 pounds of wheat will not buy 100 pounds of tankage.

Peas. Peas may be considered a protein supplement when they are too high in price to feed in larger quantities. With one part of peas and six parts of ground wheat, pigs weighing 150 pounds gained 1.83 pounds per day for 42 days, requiring 442 pounds of feed for 100 pounds of gain. These pigs dressed 79.5 per cent. Peas, however, should not be considered a sufficient supplement for more extended periods as work at this station points to disturbances arising in the form of lame back and paralytic rear quarters when 68 pound pigs were fed peas only for 120 days. These difficulties prevailed, although not so generally, in a similar lot fed a mixture of one part peas and 2.5 parts barley, but did not occur in lots fed peas, or peas and barley when a mineral mixture of steamed bone meal 30 parts, finely ground limestone 30 parts, and common salt 20 parts was supplied in the grain ration.

Linseed Oil Meal. About twice as much linseed oil meal as digester tankage is required to balance a ration of wheat or barley. A mixture of two parts of tankage, one part of oil-meal and one part of cut alfalfa hay, leaves or meal is a good protein supplement with corn, wheat

or barley. Ten pounds of this mixture may be fed with 100 pounds of barley or wheat.

Soybeans. Harvested soybeans may be fed as a supplement. From 10 to 12 per cent of soybeans may be fed with corn, wheat or barley. Some skim milk or tankage should be added to the ration for best results.

Alfalfa Hay. It is advisable to use alfalfa leaves or hay in swine feeding. Alfalfa should not be fed to exceed 5 per cent of the ration if rapid gains are required. More may be used when large daily gains are considered not so important. It is profitable, with normal hay prices, to let the hogs work over alfalfa hay that has not been chopped. This method saves the expense of chopping the hay and the hogs will not eat so much of the bulky fibrous stems as they are forced to eat when cut hay is mixed with the grain. Alfalfa should be made available for swine in one form or another throughout the year in regions where it can be produced.

Commercial Feeds. A number of commercial feeds are on the market that carry a moderate amount of protein and are designed to be used in rather large quantities with the cereals. The manufacturer usually advises the use of his products up to one-fourth or one-third of the entire ration. The protein content of these feeds generally is, first of all, too low — the farmer having to buy too many pounds in order to get enough protein, and, furthermore, the protein present is largely of plant origin, the kind which the farmer can produce on his own farm. Purchased supplements should be of animal origin as it is possible to produce sufficient plant protein to satisfactorily produce swine wherever legumes can be grown.

Succulent Feeds

Potatoes. About 425 pounds of cooked potatoes are required to replace 100 pounds of grain when not more than 3 or 4 pounds of cooked potatoes are fed with each pound of grain. If 2 pounds of cooked potatoes are fed with each pound of grain, 350 pounds of potatoes will have the value of 100 pounds of grain. The grain should not be cooked, but may be mixed with the potatoes after they are cooked and cooled. Raw potatoes are only from one-half to two-thirds as efficient as cooked potatoes as a feed for swine.

Roots. Roots are palatable, succulent, and laxative and therefore have a place in brood sow rations. They should be chopped before they are fed to swine. From 400 to 450 pounds of chopped sugar beets will replace 100 pounds of grain when 2 or 3 pounds of beets are fed with each pound of grain.

Pumpkins. Pumpkins are fed to swine with success. They are fed raw to the best advantage. The seeds should not be removed when feeding pumpkins, nor should large amounts of seeds be fed alone. The proportion of pumpkins to grain fed for good results should be about 2 or 3 pounds of pumpkins to one pound of grain.

Silage. The large amount of fiber in silage makes it undesirable as a feed for hogs. The value in silage lies primarily in the amount of corn or grain which it contains.

Artichokes. This crop does not successfully compete with other crops in the State. They seem adapted, however, to some of the cut-over lands.

Methods of Feeding

Hand Feeding. A number of points must be observed when hand feeding is done. It is better to under-feed a little than to over-feed. Enough trough space should be provided to give all hogs an equal chance when limited rations are fed. This is to be especially emphasized if the hogs are of different size. The feeding should be done at regular intervals and all troughs and floors kept clean so as to maintain the appetite of the pigs.

Self-feeder. The self-feeder method may be used when hogs are on a full grain feed. With this method the hogs have their freedom with respect to the time and amount they eat. Self-feeders should be examined each day to make sure the grain is feeding properly. Self-fed hogs eat more and gain faster, as a rule, than hand-fed hogs; but require about the same amount of grain for the gains made. The self-feeder method is a labor-saver.

A good quality, palatable grain mixture should be supplied in the self-feeder if the protein supplements are fed in a separate compartment or the hogs may eat more than necessary of the more expensive supplements which are, as a rule, palatable.

Salt

All classes of hogs should have salt. It is possibly the only mineral that it is necessary to provide throughout the year when legume forages and legume hay, dairy products, and tankage are available. Free access to salt when pigs are not accustomed to it, or feeding an overdose often proves fatal (*See treatment for scours on page* 58). Salt may be fed to the extent of one-half of a pound mixed with each 100 pounds of grain. Larger amounts often cause pigs to scour. If a mineral mixture is fed, the salt may be included. Salt may also be fed with wood ashes. The latter is desirable in getting swine accustomed to salt if later they are to be given free access to it.

Minerals

Calcium. Grains and grain by-products are deficient in calcium. It is common for hogs that are fed only wheat and barley to break down with posterior paralysis, commonly called rickets. The deficiency of minerals often brings about a condition of extreme pain plainly evident when the hog moves around. In a number of cases hogs fed the grains alone break down on their way to market. Brood sows that do not get enough calcium fail to produce strong pigs and when they are required to produce litters twice a year, often break down with posterior paralysis.

Protein supplements, such as tankage, fish meal, skim milk and alfalfa, commonly used to balance the protein requirement, will generally correct the calcium deficiency in the grains when fed in the amounts recommended for balancing the ration (*See Protein Supplements page* 19). Alfalfa should be supplied throughout the year. It is high in protein, and contains necessary vitamins.

It is probable that mineral mixtures are not so essential if one of the protein supplements mentioned above and alfalfa are fed. However, if it is the desire to feed minerals, it is likely that a mixture composed of equal parts of common salt, finely ground limestone, or lime (not quicklime) and steamed bone meal will prove adequate for general conditions in this State. This mixture may be self-fed in a box after the pigs are accustomed to it, or 1½ pounds of the mixture may be fed with each 100 pounds of grain.

Calcium deficiency is so prevalent among hogs in this State that too much attention cannot be given to the balancing of swine rations in regard to this mineral. If no animal by-products are being fed, either a mineral mixture should be provided as mentioned above, or 2 per cent of ground limestone or oyster shell should be included in the grain mixture. It is a safer practice in hog feeding to provide all the nutrients in a mixture rather than to rely on the judgment of the pigs to supply their own body needs. Less trouble is encountered in the growing and fattening of hogs if the protein, mineral and vitamin supplements are incorporated in the grain mixture. Adopt the golden rule of hog feeding "to provide all grain mixtures with the proper amount and quality of protein, minerals and vitamins."

Iodine. There are a few restricted areas in the State in which hairlessness is found in pigs which is caused by an iodine deficiency. In such areas 1/3 ounce of potassium iodide may be added to each 100 pounds of the limestone, bone meal, salt formula mentioned above. This may be self-fed after pigs become accustomed to it. One ounce of potassium iodide may be added to 100 pounds of common salt and ½ pound of this mixture may be fed with each 100 pounds of feed.

Iron and Copper. Suckling pigs confined to enclosures with concrete or wooden floors so that the pigs do not have access to soil usually develop nutritional anemia in about 2 to 3 weeks after birth. Anemia is caused by a lack of sufficient iron and copper in the mother's milk, and since milk is naturally deficient in these mineral elements the little pig must seek other sources to satisfy this nutritional requirement. One of the most practical and successful ways to prevent anemia is to provide plenty of clean dirt for the pigs to eat. Fresh dirt should be placed in the pens at frequent intervals. Clean soil (free from parasite eggs) usually contains sufficient iron and copper to supply this need. There are certain areas where the soil is not rich enough in iron and copper to prevent anemia, but to our knowledge deficient areas do not occur in Idaho. Another treatment for anemia is to swab the sow's udder daily with a saturated solution of ferrous sulphate. As soon as the pigs start eating grain, special treatments for anemia may be discontinued.

Vitamins

Vitamin A is frequently lacking in swine rations, because all grains and grain by-products, excepting yellow corn, are deficient in vitamin A. Vitamin A is abundant in green pasture and good leafy, green alfalfa hay. It is always a safe and profitable practice to add 5 per cent of ground alfalfa to all swine rations. The alfalfa should be ground sufficiently fine to make a smooth blend with the grain mixture. For fattening hogs 5 per cent of alfalfa is adequate, but for brood sows and growing breeding stock 10 to 15 per cent of ground alfalfa may be included in the ration. In case ground alfalfa is not available, fine-stemmed leafy alfalfa hay may be fed in a suitable hay rack. The method works satisfactorily for breeding stock but when hogs are being full-fed on grain, the quantity of alfalfa hay consumed is usually not sufficient to satisfy their vitamin A requirements. It is the best and safest swine husbandry to mix the alfalfa in the ration.

A lack of adequate vitamin A in the ration reduces materially the rate of gain and increases the feed requirements. Where there is only a slight vitamin A deficiency poor gains may result without apparent symptoms of the deficiency. An acute case of vitamin A deficiency results in stiff joints, posterior paralysis, rough hair coat, loss of appetite, and respiratory complications. Usually secondary lung infections result in pneumonia and death. Boars and sows fail to breed successfully when vitamin A is lacking. The sterility of a boar or sow or a litter of blind and weak pigs may result from the lack of vitamin A. Vitamin A is one of the most common feed deficiencies in swine in the Northwest.

Vitamin D is commonly known as the "sunshine vitamin" for the ultra-violet rays of the sun will prevent rickets. Rickets is a disturbance of the calcium and phosphorus metabolism of the bones, which may be caused by a lack of calcium, phosphorus, vitamin D, or a combination of these factors. Pigs suffering from rickets become stiff, lose weight, the joints enlarge, the legs are weak and crooked, and a general unthrifty appearance results. In severe cases posterior paralysis occurs, which is due in certain instances to a fracture of the backbone resulting in a nerve injury.

A rachitic condition is most likely to occur among pigs during the fall and winter months, when they are confined indoors. As long as pigs are allowed access to the direct rays of the sun, there is little danger of a vitamin D deficiency excepting during cloudy months. Even in the coldest weather, it is a good practice to allow the pigs to be outdoors for a few hours when the maximum amount of sunshine is available. Pigs that are being grown out rapidly and fattened for market are most susceptible to a vitamin D deficiency because the body requirements are high.

Good sources of vitamin D are direct sunshine, cod-liver oil and sun-cured legume hay. Hay is not a very reliable source of vitamin D for pigs because, especially in fattening hogs, sufficient hay is not consumed to satisfy their requirements. The addition of 1 per cent of

natural cod-liver oil to the grain ration will supply ample vitamin D to carry the pigs through periods when ample sunshine is not available.

Many of our winter feeding troubles with swine can be attributed to the lack of sufficient calcium and vitamins A and D in the ration. Be sure that calcium and vitamins A and D are present in the rations. Many dollars can be saved by properly feeding swine, for they respond very readily to good feed and are very efficient converters of feed into meat products if properly fed.

Medicinal Condiments

It is better to give specific worm remedies than to feed complex mineral mixtures that are designed to rid pigs of parasites. Specific drugs are in the end cheaper and more effective (*See round worms, page* 59).

Water for Swine

Clean water is as important as good feed for swine. Fresh water should be supplied at least three times daily. If clean running water or an automatic watering device is not available, the water should be made available in troughs that are kept clean. Troughs with cross bars over the top are best for this purpose. (*Figs.* 16 *and* 17).

Management

Housing and Equipment

Swine are not able to adjust themselves properly to extreme and sudden changes in climate unless they are adequately equipped with satisfactory shelter. Shelter for swine need not be expensive to be efficient. Houses should be warm, well-ventilated, convenient and well-lighted. They should also be durable, and it costs little more to make them pleasing in appearance.

The field or colony house and the central house are both used successfully in Idaho (*Fig.* 11). The "A" type field house (*Fig.* 12) may be made very cheaply and will accommodate one sow and a litter. The one-way roof field house (*Fig.* 13) affords more room than the "A" house. This house will accommodate two or three sows with their litters after they are trained to stay together. Farrowing rails may be used conveniently in this type of house (*Fig.* 23). It is very satisfactory for winter management and can be moved easily. Ample ventilation is provided in both types of houses and in very cold weather a burlap blanket suspended in the doorway helps keep out the chill and allows the hogs to walk in and out at will. A board tacked on the bottom of the burlap blanket will hold it in place. The house should be located with the door on the lee side and with the window toward the sun as much as possible in the winter. The window side of the house may be turned toward the north in the summer. Field houses are very practical for carrying out the management details in a sanitation program.

Central houses should be carefully located. These are more expensive than the colony types, but are more durable and make possible more systematic ventilation, and add to the convenience of the feeding. They are not practical for small herds. With central houses, as a rule, more fencing is required for lanes to outlying pasture lots. Fire risks are greater with central houses.

The individual and central type houses should not necessarily be considered as separate systems. The two types can be combined when a

Figure 11.—Housing combination in use at Idaho Experiment Station, Moscow. Individual houses below. Central house above which accommodates 20 brood sows in individual pens.

sufficient number of hogs are produced to warrant the expenditure. (*Plans and specifications for central houses are available through Department of Agricultural Engineering, Idaho Agricultural Experiment Station, Moscow, Idaho.*)

Colony Unit. The colony unit, illustrated in Figure 21, offers a number of advantages that are common to the central swine barn, and at a lower cost. The only permanent construction in the colony unit is the floor. The colony houses and the feed storage are all portable and

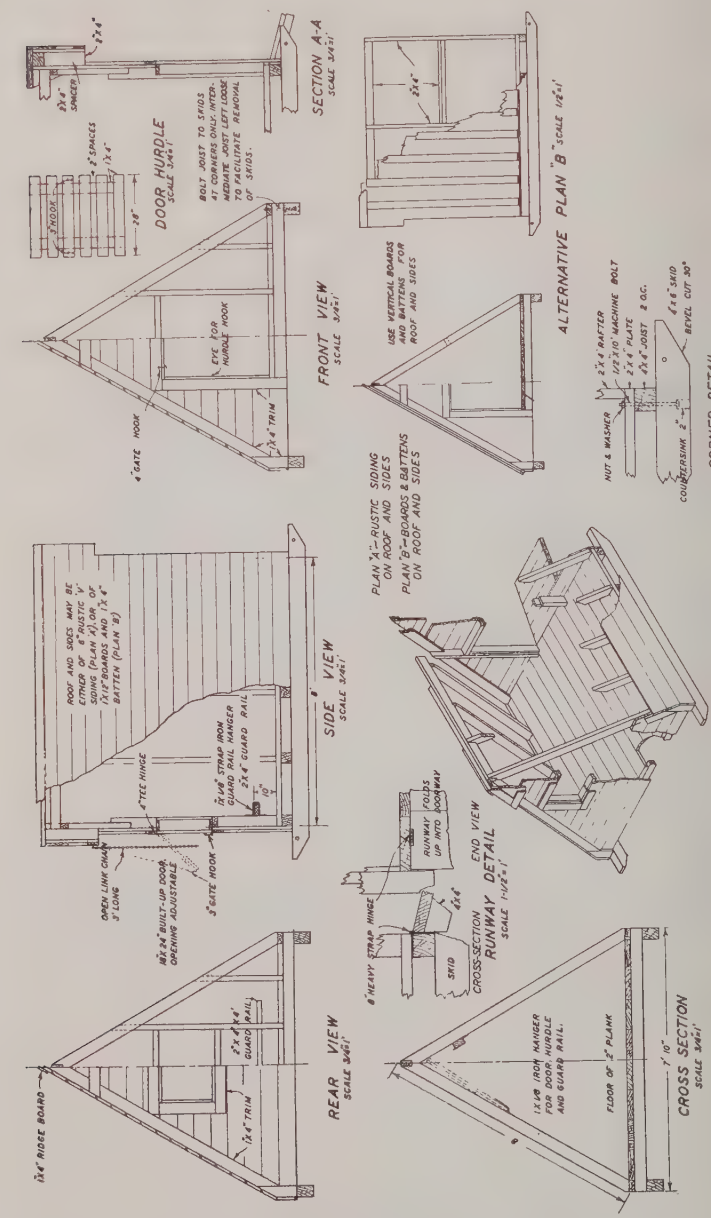

Figure 12.—"A" type field house. Plan (A) with rustic siding, roof and ends. Plan (B) with board and battens. (Specifications for all types of equipment discussed in this bulletin available through Department of Agricultural Engineering of this Station).

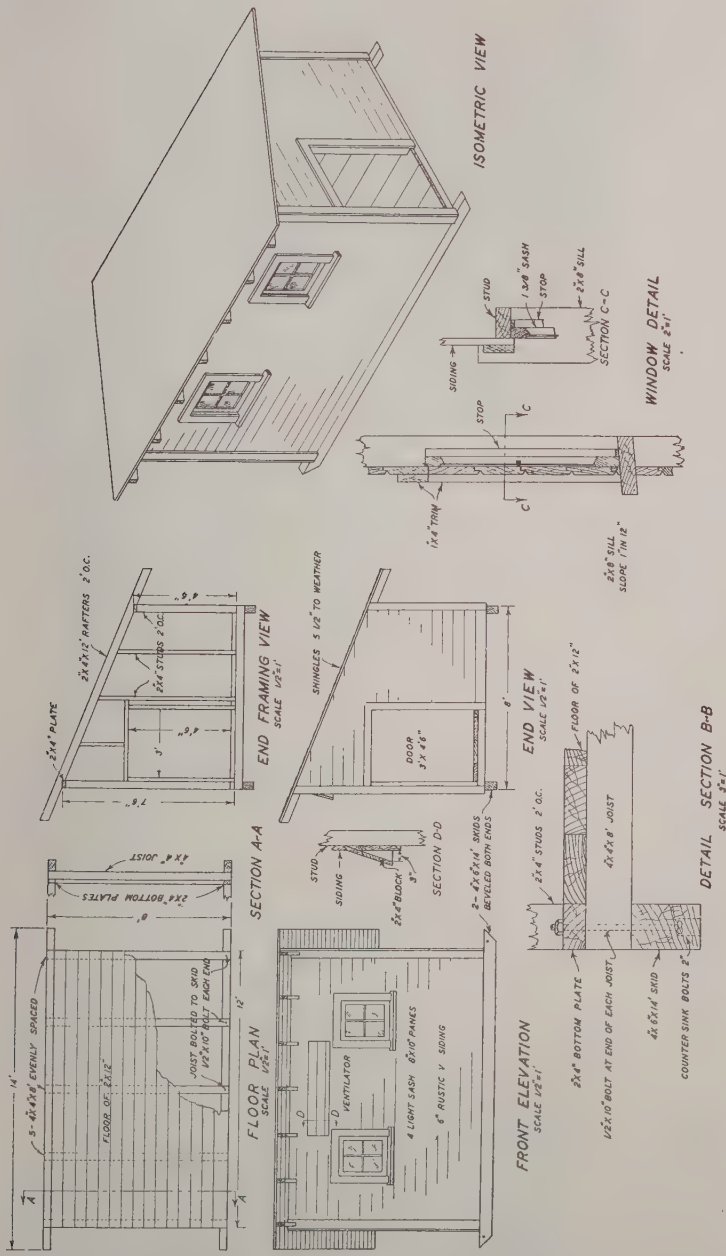

Figure 13.—One-way field house. A satisfactory type when more room is desired than is available in the "A" type.

can be moved as required, thus avoiding the necessity of duplication in summer and winter equipment.

For winter management the colony houses are usually moved onto the central feeding floor. This is also a convenient place for them during farrowing as it centralizes the operations. The permanent floor can be thoroughly cleaned before the farrowing begins (*See Sanitation Program, page* 51).

The permanent floor can also be used as a feeding floor when bundle grain, pea vines, etc., are fed, or, of course, for threshed grain as well.

Loading Chute. When a portable chute is desired, the plan in Figure 14 may be used. This chute is designed to endure considerable wear and will stand up even though these is appreciable crowding when the hogs are passing up the chute. Portable chutes of this kind must obviously be supported at the wagon end. A satisfactory support is shown

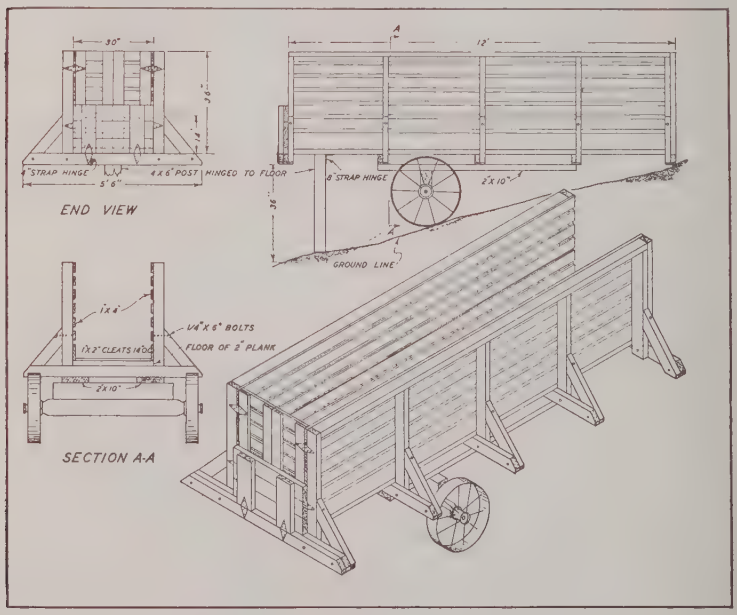

Figure 14.—Portable loading chute.

in this plan. This support is adequate so long as it has good footing. Whenever it is practical the chute may rest on the wagon or truck floor.

Troughs. This type of equipment is probably the simplest and there are many satisfactory types in use. Troughs are expensive equipment if they are not efficiently made of durable materials. It will be observed that two-inch material is recommended for the troughs in Figures 16 and 17. Notice also that the ends of each

trough carry a two-inch reinforcement that is sawed to fit accurately the inside shape of the trough. This materially strengthens the trough by making it possible to drive the nails into the side pieces in two direc-

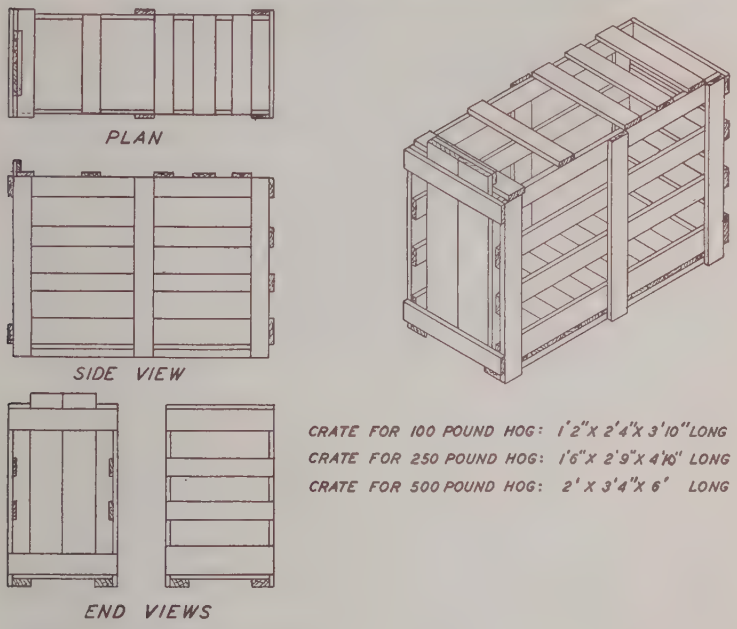
PLAN
SIDE VIEW
END VIEWS
CRATE FOR 100 POUND HOG: 1'2"X 2'4"X 3'10" LONG
CRATE FOR 250 POUND HOG: 1'6"X 2'9"X 4'10" LONG
CRATE FOR 500 POUND HOG: 2' X 3'4"X 6' LONG

Figure 15.—Shipping crate. The dimensions specified for the various weights are satisfactory under normal conditions.

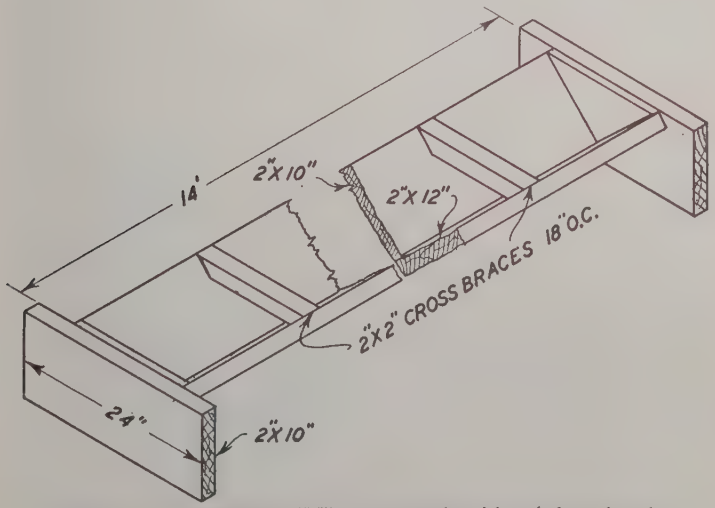

Figure 16.—Conventional "V" type trough with reinforced ends.

tions. With this end reinforcement, the trough will not leak so readily. The cross braces can obviously be fastened in different ways. One should, however, not cut into the side pieces of the trough.

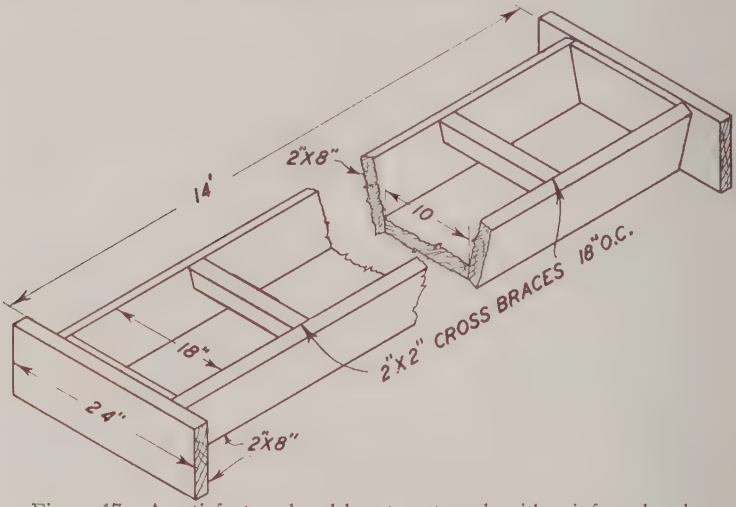

Figure 17.—A satisfactory bevel box-type trough with reinforced ends.

Shipping Crates. Shipping crates should be made of light but durable materials. The dimensions indicated in Fig. 15 are satisfactory under normal conditions. When building crates, it is well to keep in mind that hogs of the same weight differ considerably in length, width, and height.

Castrating Crate. A castrating crate is of course not an absolutely essential piece of equipment. However, many are in use on farms because they make the work of castrating pigs much easier and also make it possible to keep the pig out of the dirt when the operation is performed. The disinfectant can be kept in a pan on the 1"x 12" shelf immediately under the trough. It is common practice to castrate the pig crop on a rainy day when field work has to be temporarily suspended. Under such conditions, the opportunity of doing the castrating job off the wet ground is appreciated. The crate in Figure 18 suggests one plan that is practical.

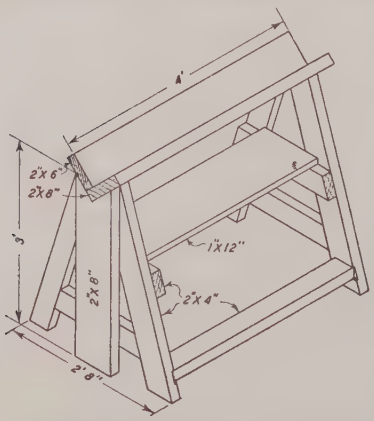

Figure 18.—Convenient castrating crate. By means of this crate the pig can be kept clean during the operation.

Lifting Crate. This crate is used primarily when it becomes necessary to trim the feet of hogs. This phase of management is of course not new to breeders of purebred swine who exhibit their hogs. When the claws on heavy hogs grow too long, they are likely to break off,

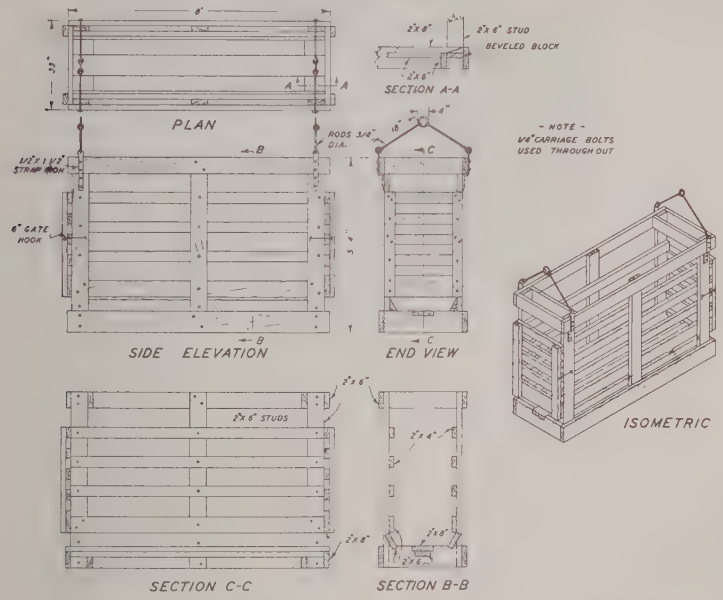

Figure 19.—Lifting crate.

Figure 20.—An inexpensive shade which is practical when natural shade is not available.

causing severe lameness, and it may become necessary to confine them in a lifting crate to make it possible to trim the feet properly (*Fig.* 19).

Wallows. Wallows usually work out better in theory than in practice. They are a source of disease contamination if they are not kept clean. It is practically impossible to keep them sanitary. Protection from excessive heat should be provided by the use of natural shade and running water when that is available.

Shade. Natural shade is desirable. If that is not available, a temporary shade (*Fig.* 20) may be provided. This should be located where the air is likely to move freely.

Table 4.—"A" type portable hog house—building material for plan "A" (with rustic siding, roof and ends).

Material as Bought			Material as Used		
No. of Pieces	Size of Stock (inches)	Length (feet)	No. of Pieces	Length (feet)	Use
2	4x6	10′	2	10′	Skids
5	4x4	8′	5	8′	Joists
1	4x4	6′	2	3′	Runway joist
12	2x4	8′	12	8′	Plates and rafters
4	2x4	8′	4	2′8″	Studs
			4	5′2″	
1	2x4	8′	1	8′	Ridge pole
1	2x4	14′	1	2′6″	Door lintel
			2	2′	Window
			4	1′8″	Ventilator
1	1x4	10′	2	3′2″	Window trim
			2	1′8″	
1	1x4	8′	2	2′2″	Window casing
			2	1′6″	
4	1x4	8′	4	7′8″	Corner trim
1	1x4	10′	2	3′2″	Door casing
			1	2′6″	
1	1x4	12′	2	3′9″	Door trim
			1	3′2″	
1	1x4	8′	4	4′	Ventilator trim
			2	1′8″	
2	1x6	10′	2	9′	Ridge boards
2	1x4	10′	6	2′4″	Door hurdle
			2	2′10″	
7	2x12	8′	7	8′	Floor
1	2x6	8′	1	8′	Floor
1	2x12	8′	3	2′6″	Floor of runway

40 Bd. Ft. 1″x6″x10′
200 Bd. Ft. 1″x6″x 8′

Summary			
No. of Pieces	Size of Stock (inches)	Length (feet)	Board Feet
2	4x6	10	40
5	4x4	8	53
1	4x4	6	8
7	2x12	8	128
1	2x6	8	8
17	2x4	8	91
1	2x4	14	9
3	1x4	10	10
1	1x4	12	4
6	1x4	8	16
2	1x6	10	10
Rustic	1x6	10	40
Rustic	1x6	8	200
		Total	617

Miscellaneous
4—½″x10″ bolts and washers
2—8″ strap hinges
2—4″ T hinges
3—3″ gate hooks and eyes
2—4″ gate hooks and eyes
3′ wire chain
6′—1″x⅛″ strap iron
4 lb. 20d nails
6 lb. 8d nails

Table 5.—"A" type portable hog house—building material for plan "B" (board and battens).

Material as Bought			Material as Used		
No. of Pieces	Size of Stock (inches)	Length (feet)	No. of Pieces	Length (feet)	Use
2	4x6	10′	2	10′	Skids
5	4x4	8′	5	8′	Joist
1	4x4	6′	2	3′	Joist for runway
7	2x12	8′	7	8′	Flooring
1	2x6	8′	1	8′	Flooring
8	2x4	8′	8	8′	Plates and rafters
2	2x4	8′	4	3′9″	Purlins
1	2x4	10′	1	9′	Ridge pole
1	2x4	14′	1	2′6″	Door lintel
			2	2′	Window
			4	1′8″	Ventilator
2	2x4	10′	4	5′	Studs, window and door
1	2x4	10′	4	2′6″	End studs
2	1x6	10′	2	9′	Ridge boards
2	1x4	10′	6	2′4″	Door hurdle
			2	2′10″	
26	1x12	8′	18	8′	Roof
			8	Vary	Ends
25	1x4	8′			Battens
1	1x4	10′	2	3′2″	Window trim
			2	1′8″	
1	1x4	8′	2	2′2″	Window casing
			2	1′6″	
4	1x4	8′	4	7′8″	Corner trim
1	1x4	10′	2	3′2″	Door casing
			1	2′6″	
1	1x4	12′	2	3′9″	Door trim
			1	3′2″	
1	2x12	8′	3	2′6″	Runway floor

Summary

No. of Pieces	Size of Stock (inches)	Length (feet)	Board Feet
2	4x6	10	40
5	4x4	8	53
1	4x4	6	8
8	2x12	8	112
1	2x6	8	8
10	2x4	8	54
4	2x4	10	27
1	2x4	14	9
2	1x6	10	10
26	1x12	8	208
1	1x4	12	4
4	1x4	10	13
30	1x4	8	80
		Total	626

Miscellaneous

4—½″x10″ bolts and washers
2—8″ strap hinges
2—4″ T hinges
3—3″ gate hooks and eyes
2—4″ gate hooks and eyes
3′ wire chain
6′—1″x⅛″ strap iron
7 lb. 8d nails
4 lb. 20d nails

Table 6.—Bill of materials for shed roof field house.

Material as Bought			Material as Used		
No. of Pieces	Size of Stock (inches)	Length (feet)	No. of Pieces	Length (feet)	Use
2	4x6	14′	2	14′	Skids
5	4x4	8′	5	8′	Joists
7	2x12	12′	7	12′	Flooring
1	2x6	12′	1	12′	Flooring
1	2x8	6′	2	2′8″	Window sill
7	2x4	12′	7	12′	Rafters
4	2x4	12′	4	12′	Plates
7	2x4	12′	7	7′2″	Studs, front
			7	4′2″	Studs, back
2	2x4	12′	2	6′	Studs, end
			2	5′3″	Studs, end
1	2x4	14′	1	6′10″	Studs, end
			1	4′6″	Door stud
			1	2″	Door stud
5	1x4	16′			Trim
1	2x4	8′	1	4′6″	Door stud
			1	3′6″	Door lintel

Summary

No. of Pieces	Size of Stock (inches)	Length (feet)	Board Feet	Miscellaneous
2	4x6	14	56	
5	4x4	8	53	
1	2x6	12	12	10—½″x12″ bolts
1	2x8	6	8	2—4-light sash, 8″x10″ panes
20	2x4	12	160	3½ lb. 3d nails
1	2x4	14	10	10 lb. 8d nails
1	2x4	8	5	7 lb. 20d nails
5	1x4	16	27	
Sheeting			200	
Rustic V siding			300	
		Total	831	
4 bundles shingles				

Table 7.—Bill of materials for portable loading chute.

Material as Bought			Material as Used		
No. of Pieces	Size of Stock (inches)	Length (feet)	No. of Pieces	Length (feet)	Use
12	1x4	12′	12	12′	Sides
2	1x6	14′	2	12′	Sides
			2	1′2″	Doors
2	2x4	12′	2	11′10″	Top
6	2x4	12′	12	3′4″	Sides, vertical
			6	5′6″	Joist
2	2x4	10′	10	2′	Braces
3	2x10	12′	3	12′	Floor
2	1x2	14′	10	2′6″	Cleats
1	2x10	12′	2	6′	Cart frame
1	4x6	8′	1	3′9″	Bollster
			1	3′	Prop
1	2x6	12′	2	1′6″	Lower door
			3	2′6″	Lower door
1	1x4	12′	4	3′	Doors
1	1x4	14′	12	1′2″	Doors

Summary

No. of Pieces	Size of Stock (inches)	Length (feet)	Board Feet	Miscellaneous
13	1x4	12	52	
2	1x6	14	14	
8	2x4	12	64	6—4″ strap hinges
2	2x4	10	13	1—8″ strap hinge
4	2x10	12	80	14—¼″x6″ bolts and washers
2	1x2	14	Linear	16—¼″x4″ bolts and washers
1	4x6	8	16	2—⅜″x14″ bolts and washers
13	1x4	12		10 lb. 8d nails
1	2x6	12	12	2 lb. 16d nails
1	1x4	14	5	
		Total	256	

Table 8.—Bill of materials for lifting crate.

Material as Bought			Material as Used		
No. of Pieces	Size of Stock (inches)	Length (feet)	No. of Pieces	Length (feet)	Use
7	2x6	8′	3	8′	Sides and bottom
			4	7′8″	Sides and bottom
6	2x4	8′	6	8′7″	Sides
3	2x8	8′	3	8′	Sides and bottom
1	2x8	10′	4	2′6″	Doors and ends
1	2x6	10′	4	2′6″	Ends
1	2x4	14′	4	3′4″	Doors
2	2x4	10′	8	2′6″	Doors
3	2x6	12′	6	5′4″	Uprights and blocks

Summary

No. of Pieces	Size of Stock (inches)	Length (feet)	Board Feet	Miscellaneous
1	2x8	10	13	56″—½″x1½″ strap iron
3	2x8	8	32	2 steel rings, 4″ outside diameter, of ¾″ material
3	2x6	12	36	
1	2x6	10	10	7′4″x¾″ iron rod
7	2x6	8	48	4—6″ strap hinges
1	2x4	14	9	2—6″ gate hooks
2	2x4	10	14	16—½″x4½″ bolts and nuts
6	2x4	8	32	88—⅛″x4″ bolts and nuts
		Total	194	12—¼″x8″ bolts and nuts

Table 9.—Bill of materials for castrating crate.

Material as Bought			Material as Used		
No. of Pieces	Size of Stock (inches)	Length (feet)	No. of Pieces	Length (feet)	Use
1	2x8	10′	2	3′	End uprights
			1	4′	Top
1	2x6	4′	1	4′	Top
1	2x4	10′	4	3′2″	Legs
			2	3′2″	Cross braces
1	2x4	8′	4	1′9″	Leg braces
1	1x12	4′	1	3′9″	Shelf

Summary

No. of Pieces	Size of Stock	Length	Board Feet
1	2x8	10′	13⅓
1	2x6	4′	4
2	2x4	10′	13⅓
1	2x4	8′	5⅓
1	1x12	4′	4
		Total	39⅔

Table 10.—Bill of materials for hog shipping crates.

Material as Bought			Material as Used		
No. of Pieces	Size of Stock (inches)	Length (feet)	No. of Pieces	Length (feet)	Use
Crate for 100-pound hog: 1'2"x2'4"x3'10"					
1	1x6	12'	9	1'4"	Floor
1	1x6	10'	3	2'8"	Door
			1	1'6"	End
1	1x6	8'	2	3'10"	Sides at bottom
2	1x4	8'	6	2'7"	Sides
1	1x4	10'	6	1'6"	Top at ends
3	1x4	8'	6	3'10"	Sides
1	1x4	8'	4	1'4"	Top
			2	1'4"	Door cross-pieces
1	2x4	8'	2	4'	Floor joist

Summary

1—2x4x8	6 Board Feet
1—1x6x12	6
1—1x6x10	5
1—1x6x8	4
1—1x4x10	3
6—1x4x8	16
	40 Board Feet

Crate for 250-pound hog: 1'6"x2'9"x4'4"					
2	1x6	8'	10	1'8"	Floor
1	1x6	12'	3	3'2"	Door
			1	1'10"	End
1	1x6	10'	2	4'4"	Sides at bottom
2	1x4	10'	6	3'	Sides (vertical)
1	1x4	12'	6	1'10"	Top and ends
2	1x4	14'	6	4'4"	Sides
1	1x4	10'	4	1'8"	Top
			2	1'8"	Door cross-pieces
1	2x4	10'	2	4'6"	Floor joists

Summary

2—1x6x8	8 Board Feet
1—1x6x12	6
1—1x6x10	5
3—1x4x10	10
1—1x4x12	4
2—1x4x14	9
1—2x4x10	7
	49 Board Feet

Crate for 500-pound hog: 2'x3'4"x6'					
2	1x8	12'	10	2'2"	Floor
4*	1x4	12'	7	6'	Floor
1	1x6	14'	3	3'9"	Door
			1	2'4"	End
1	1x8	12'	2	6'	Sides at bottom
2	1x4	12'	6	3'7"	Sides (vertical)
1	1x4	14'	6	2'4"	Top and ends
3	1x6	12'	6	6'	Sides
1	1x4	14'	4	2'2"	Top
			2	2'2"	Door cross-pieces
1	2x4	12'	2	6'	Joists (floor)

Summary

5—1x6x12	30 Board Feet
6—1x4x12	24
1—1x6x14	7
1—1x8x12	8
2—1x4x14	10
1—2x4x12	8
	87 Board Feet

*The floor is made double thickness to support heavy hogs, the top layers of boards being laid lengthwise.

Feeding and Management

Boars. A boar should not be used much for breeding before he is 8 months of age. When buying a boar, it is usually desirable not to make a selection before the pig is at least 5 or 6 months old. It often happens if a pig is selected at a younger age that he will not meet expectations if he is subjected to new surroundings and a change in feeding and management. It is of advantage also to have more maturity in the pig when the selection is made so the characteristics which serve as guides in selection will be more developed.

Boars should not be allowed to run with the sow herd. This applies especially to immature boars. Experimental evidence published by this station indicates poor results from such practice. Some sows fail to settle, and those that do settle often produce small litters when the boar is allowed to run with the herd. A young boar should not be allowed more than one service a day for a short breeding season and

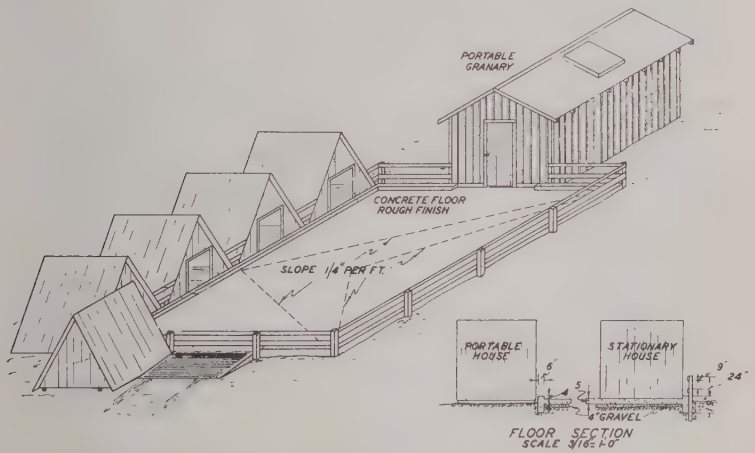

Figure 21.—A good feeding floor can be used conveniently for early spring farrowing or as a centralized unit for wintering sows. Plans and specifications available through Department of Agricultural Engineering, University of Idaho.

preferably only one every other day for a longer season. A mature boar may be allowed two services each day if the breeding season is of normal length. No sow need be bred more than once each time she is in heat. In one case, a young boar which was allowed to run with 10 sows that had previously farrowed an average of 8.7 pigs per litter, sired litters that varied from one to six pigs with an average of 3.4 pigs per litter. In another similar case a young boar that was allowed to run with the herd settled 3 sows out of 16 and the litters farrowed were small (*More detailed information on sterility in boars is available at this station*).

The boar should be kept in a good sized lot which is equipped with comfortable sleeping quarters in winter. This lot should not join the

lot in which the sows are kept. He should be kept on pasture during the forage season.

Boars are, as a rule, irregular feeders. During the breeding season they go off feed very easily. It is essential during this period to give them every encouragement to stay on feed by keeping all the equipment clean and by feeding, at regular hours, a combination of feeds that is appetizing and nourishing. The boar often refuses the feed if it is left in the trough to sour. An ample amount of clean water is essential. Ranting boars are often difficult to handle. They sometimes become more quiet if a barrow or a bred sow is kept with them.

One cannot prescribe a definite grain combination for all boars. Boars are very individualistic and must be fed and managed on the basis of their individual peculiarities. The ration should be varied from time to time. Changes in the feed should be made slowly. Over-feeding usually throws the boar off feed. The boar should not be too fat or too lean. Either condition may impair his breeding ability. When the young boar is on pasture, he should be fed enough concentrates to cause him to grow normally. The mature boar will require about 1 to 2 pounds of concentrates each day for each 100 pounds of body weight when he is not in service and is in pasture. He should be fed enough so that he will not lose weight in the breeding season. In fact, he should be gaining a little. A variety of home-grown grains, with skim milk, shorts or tankage, and green feed, if available, will give good results during the breeding season. One-half pound of salt should be added to each 100 pounds of feed.

When the boar is not in service he may be fed rather simple rations.

Ration 1

	Parts by Weight
Barley, wheat or corn	1
Skim milk	1
Forage or alfalfa hay	

Ration 2

	Parts by Weight
Barley, wheat or corn	95
Tankage	5
Forage or alfalfa hay	

It is almost impossible to make up a ration for boars in service that will prove adequate for the entire season, as it seems that changes are often necessary to keep them on feed. The following rations are suggested because they have been found satisfactory in general:

Ration 1

	Parts by Weight
Barley	100
Wheat	100
Oats	100
Alfalfa, ground	15
Skim milk	600

Ration 2

	Parts by Weight
Barley	20
Oats	5
Shorts	5
Corn (yellow)	5
Tankage	3
Alfalfa, ground	3

Skim milk may be substituted for tankage in ration 2 at the rate of 12 to 15 pounds of skim milk for each pound of tankage. Corn is very palatable to swine. It is, therefore, often desirable to have some available to use in boar rations. In corn producing sections in the State corn may be substituted for the small grains, at least in part.

The feet of boars, especially heavy boars, should be trimmed back so they will not break off as they often do in the breeding season. Some boars are useless until such injuries are healed. The feet should not be trimmed so short as to expose the "quick" or they will become tender.

Sows. One of the essentials to success with the brood sow is to keep her in a vigorous condition of health. The degree of fatness is not an assurance of vigor. When the sow is bred, she should be gaining in condition. This has a practical effect in stimulating her reproductive functions.

The kind and amount of grain to feed will vary with the locality, age and condition of the sows. Home-grown feeds should comprise the bulk of all rations. Any one of the grains previously discussed

Figure 22.—Hay rack. A practical way to feed alfalfa hay. Note cover on rack. When hay becomes wet, the flavor of the hay is largely destroyed. Hay should be fed in rather small quantities and renewed at short intervals. Sows spend much time around these racks in all kinds of weather getting valuable exercise as well as very necessary food constituents.

that is produced most economically may be used with the proper supplements. Mature, dry sows in good condition will maintain their weight on 1 to 1¼ pounds of a grain mixture per day for each 100 pounds of live weight when they are on forage. Thin mature sows often need more than this amount of grain. Growing gilts intended for breeding purposes should be fed more liberally, but not all they will eat. When they get a little less than they will eat they ordinarily take more exercise and stay in a more thrifty condition. Well grown gilts may be bred when 8 months of age.

During the winter gestation period, the brood sow's ration is important. Very little forage is available during this period, hence a substitute for it should be provided whenever possible. A high quality

alfalfa hay, although not equal to forage, has been successfully used. Alfalfa hay may be fed in racks to good advantage (*Fig.* 22). This method stimulates the sows to take more exercise and helps them keep in good condition. Alfalfa hay is high in minerals and vitamins. Sows getting alfalfa hay will do well in a variety of grain combinations. Wheat, barley, or corn alone or in combination, if available, may serve as the basis for this ration. Any of the grains may be replaced in part by oats for pregnant sows and in pea producing areas one-third of the grain may be replaced with pea screenings. Too much emphasis cannot be placed on the advisability of feeding alfalfa to pregnant sows, and oats is always a good feed for open, bred, or suckling sows.

Suggested Feed Combinations for Wintering Sows

Ration 1

	Parts by Weight
*Barley	1
†Skim milk	1
Fine alfalfa hay in rack	

Ration 2

	Parts by Weight
Barley	16
Oats	6
‡Tankage	1
Fine alfalfa hay in rack	

Ration 3

	Parts by Weight
Barley	1
Wheat	1
Oats	1
Skim milk	3
Fine alfalfa hay in rack	

Ration 4

	Parts by Weight
Barley	16
Oats	8
Shorts	4
Tankage	1
Fine alfalfa hay in rack	

Ration 5

	Parts by Weight
Barley	8
Peas	2
Alfalfa, ground	1
Skim milk	6

Ration 6

	Parts by Weight
Barley	16
Oats	8
Peas	3
Alfalfa, ground	4
Tankage	1

Time to Farrow. Farmers have more time available to devote to the care of pigs when they are farrowed before the spring work. Early-farrowed pigs can utilize hogging-off crops, such as peas, in time to reach the early market. Early farrowing also offers an opportunity to produce two litters per year whenever that is deemed advisable. This method requires, as a rule, more expensive and warmer houses. Pigs farrowed early, however, are subject to a nutritional disease called "Anemia" (*See this subject under "Swine Diseases," Page* 62).

Care at Farrowing Time. The lack of proper sanitary measures is responsible for a large percentage of pig losses. Most rigid sanitary measures are necessary to destroy the little pig's worst enemy, the round worm. It has been found that round worms are very prevalent, especially in herds which have been kept in the same lots for a num-

*Wheat or corn may obviously be substituted for barley.

†When tankage is used to replace skim milk, figure 1 pound of tankage (60 per cent) equivalent to 12 to 15 pounds of skim milk.

‡Fish meal may be substituted in equal amounts for tankage and if linseed oil meal is used as part of the supplement, 2 pounds should be allowed for each pound of tankage replaced.

ber of years. Many pigs die very young from round worms (*See "Swine Sanitation," Page* 51).

Sows that are accustomed to exercise may become constipated if left in a small pen where there is little opportunity for exercise. The feeds should be made laxative by adding some bran. The amount of feed also may be reduced, but not to the point where the sow becomes unduly hungry. Constipation generally sets up a feverish condition which often results in viciousness, and in many cases pig eating. Pig eating may also occur if the sow has not been fed enough minerals, salt, or protein during the pregnancy period. It is not natural for a sow to eat her pigs. Constipation, feeding grain alone, not enough protein, salt, or minerals, and allowing her to eat her afterbirth or laid-over pigs often cause her to develop the habit (*See Fig. 23 for farrowing rails*).

Table 11.—Gestation table.

The following table is based on a 112 days gestation period. If, for instance, a sow is bred February 1, she is due to farrow May 24. If she is bred May 24, she is due to farrow September 13. The date to the immediate right of the date on which she was bred is her date to farrow. Breeding a sow November 9 to 11 will usually bring March 1 pigs.

Feb.	May	Sept.	Jan.	Apr.	Aug.	Dec.	Mar.	July	Nov.	Feb.	June	Oct.	Jan.
1	24	13	3	25	15	5	27	17	6	26	18	8	28
2	25	14	4	26	16	6	28	18	7	27	19	9	29
3	26	15	5	27	17	7	29	19	8	28	20	10	30
										Mar.			
4	27	16	6	28	18	8	30	20	9	1	21	11	31
													Feb.
5	28	17	7	29	19	9	31	21	10	2	22	12	1
							Apr.						
6	29	18	8	30	20	10	1	22	11	3	23	13	2
				May									
7	30	19	9	1	21	11	2	23	12	4	24	14	3
8	31	20	10	2	22	12	3	24	13	5	25	15	4
	June												
9	1	21	11	3	23	13	4	25	14	6	26	16	5
10	2	22	12	4	24	14	5	26	15	7	27	17	6
11	3	23	13	5	25	15	6	27	16	8	28	18	7
12	4	24	14	6	26	16	7	28	17	9	29	19	8
13	5	25	15	7	27	17	8	29	18	10	30	20	9
											July		
14	6	26	16	8	28	18	9	30	19	11	1	21	10
15	7	27	17	9	29	19	10	31	20	12	2	22	11
								Aug.					
16	8	28	18	10	30	20	11	1	21	13	3	23	12
17	9	29	19	11	31	21	12	2	22	14	4	24	13
					Sept.								
18	10	30	20	12	1	22	13	3	23	15	5	25	14
		Oct.											
19	11	1	21	13	2	23	14	4	24	16	6	26	15
20	12	2	22	14	3	24	15	5	25	17	7	27	16
21	13	3	23	15	4	25	16	6	26	18	8	28	17
22	14	4	24	16	5	26	17	7	27	19	9	29	18
23	15	5	25	17	6	27	18	8	29	20	10	30	19
24	16	6	26	18	7	28	19	9	29	21	11	31	20
												Nov.	
25	17	7	27	19	8	29	20	10	30	22	12	1	21
									Dec.				
26	18	8	28	20	9	30	21	11	1	23	13	2	22
27	19	9	29	21	10	31	22	12	2	24	14	3	23
						Jan.							
28	20	10	30	22	11	1	23	13	3	25	15	4	24
....	21	11	31	23	12	2	24	14	4	26	16	5	25

During the process of farrowing, an attendant should be at hand, especially if farrowing takes place in cold weather. If pigs chill at the time of farrowing, their chances for a good start have been re-

duced. A basket, barrel, box, or other suitable container should be at hand in which warm bricks covered with straw, or in which a jug con-

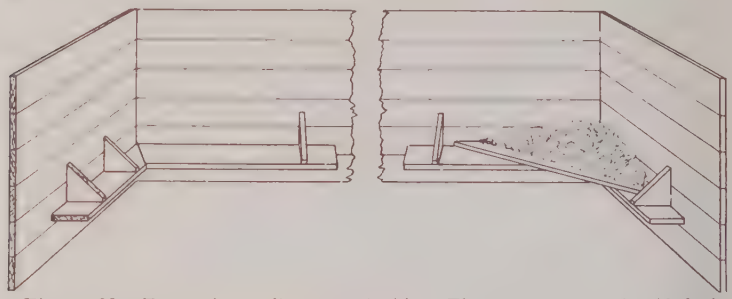

Figure 23.—Farrowing rails are valuable. They are, as a rule, 10 inches from the floor and eight inches from the wall.

taining warm water has been placed (*Fig.* 24). The pigs should be rubbed gently with a burlap bag before being placed in the container. The mucous should be removed from the mouth.

Figure 24.—In cool weather pigs may be kept comfortable in a box until they are strong enough to be left with the sow.

The pigs may be taken to the sow for nursing when they are dried off, after which they may be returned every two hours until they have gained enough strength and acquired sufficient control to get along without additional assistance. Sows that are too vicious to allow the application of this detailed management may be profitably replaced by others that are gentle.

A pig is born with eight small but very pointed tusk-like teeth, two on either side of the upper and lower jaw immediately back of the front teeth. It is generally considered advisable to clip these teeth. This can be done with a pair of side-cutting nippers (*Fig.* 25). These teeth should not be pulled out nor imperfectly cut off. Sharp projections left on the teeth often cause considerable annoyance in cutting the lips and tongues of young pigs and the teats of the sow. The jaw or gum should not be injured when cutting the "needle teeth." Make smooth cut and do not draw blood. Cuts in the jaw or gums are avenues of invasion for various types of infection that often cause sore mouth.

Marking the Pigs

It is necessary to mark purebred pigs so that they will be properly identified if they are to be recorded. Since metal tags are easily pulled out of the ears, it is more practical to use one of the well recognized systems of ear notching. Notches may be cut into the ear with a knife when the pig is small. It is preferable, however, to use a special ear-

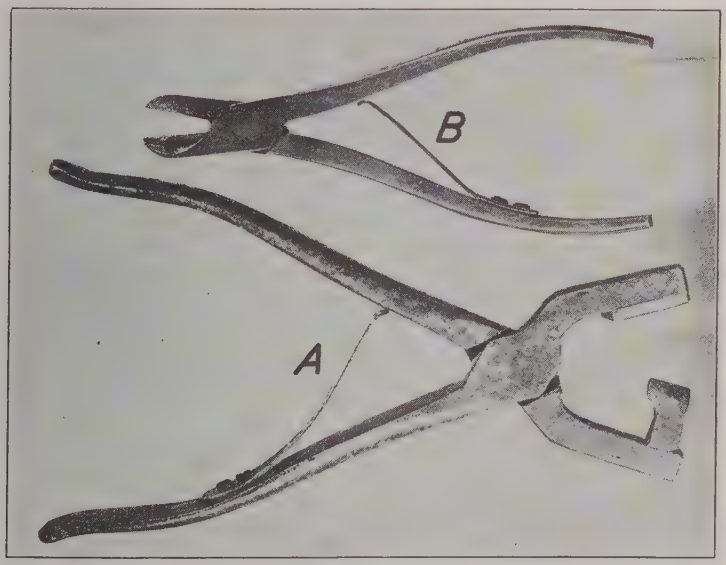

Figure 25.—**A.** Ear marker for notching the earc. **B.** Nippers commonly used for cutting "needle teeth" in young pigs.

notcher. (*Fig.* 25). Pigs should have their ears notched before the litters are allowed to intermingle. A good rule to follow is to mark the pigs the first or second day. In Figure 26 will be found a satisfactory method for marking.

Care of the Sow and Pigs

The sow should not be urged to eat during the first 24 hours after farrowing. Some sows crave feed sooner. The feeding should be

rather light the first few days. Provide clean water, however, preferably with the chill removed. There is no set rule that applies to all sows during this period of management. The attendant must study the habits of each sow. The object should be to feed enough so the sows will not become unduly hungry, and yet not so much that the flow of

Figure 26.—(At left) Value of notches in right and left ears. (At right) Ears notched to indicate No. 73.

Lower left ear	1
Lower left tip of ear	100
Upper left ear	10
Upper left tip of ear	200
Lower right ear	3
Tip of right ear	300
Upper right ear	30

milk will be stimulated too much before the pigs have developed a little size and are capable of using it all. Too much milk the first few days often develops scours in the little pigs. Scours may also be caused by filth, drafts, chills, damp bedding, and often by changing the sow's rations suddenly. The cause of scours should be removed first (*For specific treatment see "scours" under "Swine Diseases"* Page 58). One-half of the sow's ration during the period she is nursing the pigs may contain shorts or middlings, which seem to stimulate the milk flow. The feed may be made up into a slop to encourage the consumption of water. The allowance should be cleaned up at each feeding because remaining residues may become stale and sour.

Results from work done at this station on milk production in sows indicate considerable variation in the amount of milk that sows produce. Some sows produce almost 2 gallons in 24 hours when in full milk. Sows with such heavy production obviously will require considerable feed. Other sows produce scarcely 1 gallon of milk each day.

The pasture should be on clean ground where hogs were not kept the previous year. The individual house and troughs in the pasture lot should be scrubbed with boiling water (*See Swine Sanitation,* Page 51). The pigs and sow should be carted and moved to the new pasture. If the sows are driven, they may pick up worm eggs by dragging the udder over contaminated ground. Little pigs should not be kept on the same ground two years in succession, nor should they be kept on ground which has been occupied by hogs the previous year. This plan of management requires more pasture lots than are required when the same lots are utilized during successive years. In alternate years, however, the pasture lots may be cut for hay. The total

expense may be somewhat higher, but years of carefully conducted experimental work show clearly the practicability of this program.

Rations for the Sow. Sows lose as a rule, about ¾ pound a day when they are suckling pigs. Heavy milkers will lose more. When the pigs are from 10 days to 2 weeks old, the sow should be on full feed and be given all she will clean up. If she loses weight too rapidly, feed her three times a day. Any one of the following rations may be used:

Ration 1

	Parts by Weight
*Barley	100
Shorts	25
Alfalfa, ground	12
†Tankage	4

Ration 2

	Parts by Weight
Barley	100
Peas	20
Alfalfa, ground	12
Tankage	4

Ration 3

	Parts by Weight
Barley	100
Wheat	100
Alfalfa, ground	20
Tankage	12

Ration 4

	Parts by Weight
Barley	100
Oats	50
Shorts	25
Alfalfa, ground	18
Tankage	8
Or skim milk	150

Creep Feeding. Creeps should be made available for the pigs by the time they are 3 weeks old (*Fig. 27*). At this time it is preferable to give them dry feed in the form of coarsely ground wheat, or a combination of coarsely ground wheat and cracked corn. After they have become accustomed to eating, the feed may be changed to a mixture of ground wheat, corn or barley, shorts or middlings, ground oats, skim milk or tankage fed in the form of slop. The troughs must be watched so feed is not left to become sour. A good ration may be made up of ground corn, barley, or wheat, 70 parts; shorts, 26 parts; and digester tankage, 4 parts. The protein supplement may be fed entirely in the form of dairy by-products by allowing 1 to 2 pounds of skim milk for each pound of grain mixture. This ration will be suitable for the weaning age also. If the price of oats is comparable with the price of other grains, it may be fed to replace one-half of the other grains.

Weaning. At 8 to 10 weeks of age the pigs are ready to be weaned. The sow should be removed from the pigs, leaving them undisturbed in the lot with which they are familiar. The sow's ration should be reduced so the milk flow will be discouraged. Whole oats may be fed to the sow to advantage at this time. If the milk flow persists and the udder becomes caked, it should be bathed with warm water, dried off and massaged with equal parts of lard and turpentine. Her management during the summer is comparatively simple. If she has been suckled down she should be fed grain in addition to the forage until she gets back to a thrifty condition, after which she will not need much grain so long as the forage is good.

*Barley, corn or wheat may be used.

†When skim milk is available use 12 to 15 pounds in place of each pound of tankage or fish meal.

Castration. The boar pigs should be castrated preferably a week or 10 days before they are weaned. Pigs that are castrated and weaned at the same time usually undergo too great a shock. Castration should always be done under sanitary conditions and a 3 per cent solution of a standard coal tar livestock dip should be used for the scrotum and the wound. The cut should be made low so as to allow efficient drainage.

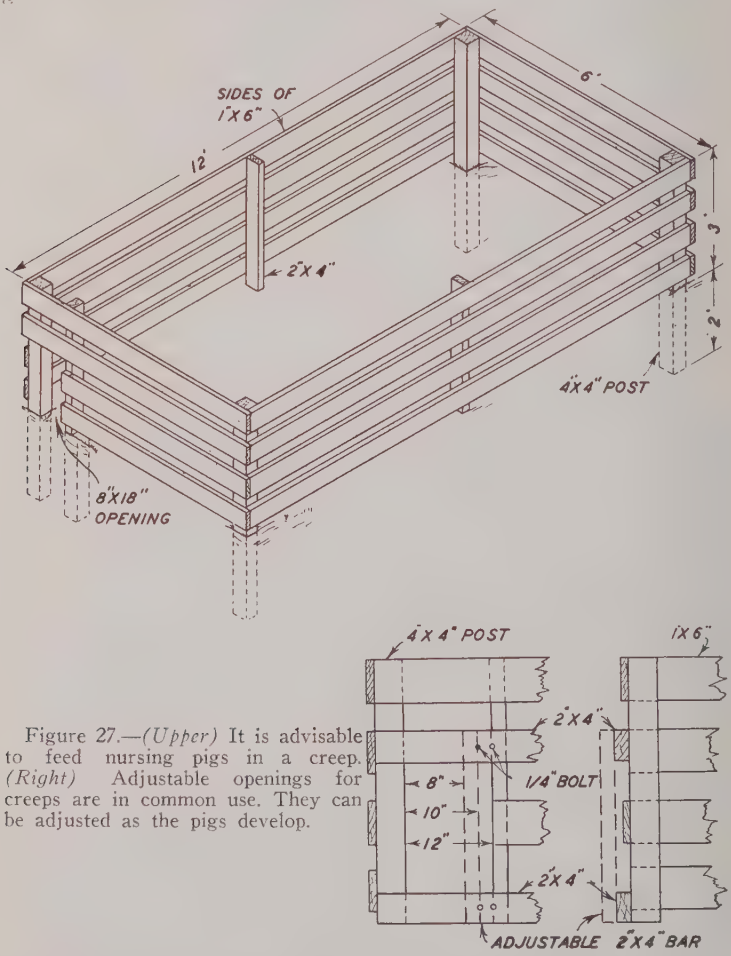

Figure 27.—*(Upper)* It is advisable to feed nursing pigs in a creep. *(Right)* Adjustable openings for creeps are in common use. They can be adjusted as the pigs develop.

Developing the Weanling Pigs. The method used in developing the pigs after weaning will have to be governed largely by the time at which they are expected to be ready for market. They must be given a full grain ration if they are to be marketed at the earliest possible date. Lighter grain feeding may be desirable if they are to be developed as feeders, with a view of hogging-off crops, or cleaning

stubble fields. The bulk of the grain which the pig that is crowded for the early market consumes has been carried over from the previous year. The pig which is developed for use in the stubble field will consume much more of the new crop. Generally speaking, the areas in the State that are suitable for the production of feeder pigs are also suitable for finishing them. Very few feeder pigs are sent out of Idaho.

Feeding the Market Hog on Forage. Pigs may be carried along on forage with a limited amount of grain or they may be fed a full ration with a view of preparing them for the early market. The amount to feed will depend upon the date one has in mind to market the hogs. Pigs on good forage, when allowed all the grain they will consume usually will gain about 1.25 pounds per day, making it possible for early March pigs to reach a satisfactory market weight by the first of September. Four pounds of grain a day for each 100 pounds of weight in hogs is considered a full ration. Thus a 50-pound pig on a full ration will consume about 2 pounds of grain a day. Pigs fed a three-fourths ration, or 3 pounds of grain for each 100 pounds of weight will gain about 1 pound per day on forage. They will gain ¾ pound per day if they receive 2 pounds of grain for each 100 pounds of live weight, and if fed only 1 pound for each 100 pounds of weight, they will gain only ½ pound per day. A number of factors determine what method to use, such as the amount of feed available, the comparative cost of feed, the price of market hogs, the time of market, the availability of waste feed to be harvested by the hogs, and the cost of carrying pigs. A choice of limited rations may be desirable if the carrying cost of pigs is small and one is not interested in early markets.

One lot of March pigs at this station, fed a full grain ration while on forage, went to market 11 days earlier and sold for $1.25 per hundredweight more than did a similar lot which was fed a grain ration limited to about three-fourths of what they would eat. The lot on a full ration cost slightly more but the increased sale price offset this by, more than $1.50 per pig in favor of the full-fed lot.

Rations made up of a variety of grains are, as a rule, preferable to any of the grains alone and to these should be added one or more protein supplements. The following are suitable combinations for full-fed pigs on forage:

Ration 1	Pounds	**Ration 2**	Pounds
Barley	75	Barley	75
Oats	25	Shorts	25
*Tankage	4	Tankage	3
Ration 3	Pounds	**Ration 4**	Pounds
Barley	30	Barley	30
Wheat	30	Wheat	30
Oats	20	Peas	20
Shorts	20	Oats	20
Tankage	2	Tankage	2

*If skim milk is used in place of tankage, use 15 pounds of skim milk for each pound of tankage replaced.

The most economical gains on the basis of feed requirements for pounds of grain are made when the pigs are young. Table 12 will give some information on the daily consumption of feed and requirements for 100 pounds of gain.

Dry Lot Feeding. Usually the hogs have to be finished for market in the dry lot. With pigs that have been on full feed during the forage

Table 12.—Relation of weight of pigs to feed consumed and rate of gain*

Wt. of Pigs	Actual average weight	Average feed eaten per day	Feed eaten daily per 100 lbs. live wt.	Average daily gain	Feed for 100 pounds gain
lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
15-50	38	2.2	6.0	.8	293
50-100	78	3.4	4.3	.8	400
100-150	128	4.8	3.8	1.1	437
150-200	174	5.9	3.5	1.2	482
200-250	320	6.6	2.9	1.3	498
250-300	226	7.4	2.7	1.5	511
300-350	271	7.5	2.4	1.4	535

*"Feeds and Feeding"—F. B. Morrison, Morrison Publishing Co., Ithaca, N. Y.

season, the period for dry-lot feeding need not be long, and the following rather simple combinations may be used:

Ration 1

	Pounds
Barley or wheat	100
Tankage	8
Alfalfa, ground	5
Or skim milk, 1 pound.... for each pound of grain.	

Ration 2

	Pounds
Barley or wheat	90 to 95
*Oats	5 to 10
Tankage	6 to 8
Alfalfa, ground	5 to 8
Or skim milk as in 1.	

*It is likely that in some cases the oats may make the ration bulky and not fattening enough for the growing hogs. If this is the case, reduce the amount of oats.

All dry lot rations for fattening hogs should contain 5 per cent of ground alfalfa or alfalfa leaves.

Table 13.—Amount of different protein supplements required to balance barley for pigs on legume pasturage*

Protein Supplement	Parts by Weight		
	Barley	Supplement	Nutritive Ratio
Skim milk (Centrifugal)	100	100	1:6.03
Buttermilk	100	100	1:6.09
Tankage (60% protein)	100	5	1:6.03
Standard wheat shorts	100	50	1:6.26
Linseed-oil Meal (o. p.)	100	12	1:6.04

*Calculations based upon digestible nutrients—F. B. Morrison's *Feeds and Feeding*, Morrison Publishing Co., Ithaca, New York. Approximately the same nutritive ratio will be obtained if wheat is substituted for barley.

Developing Pigs for the Breeding Herd. One should make the best selections possible when gilts are retained for the breeding herd. The selection should be made before the pigs are placed on a full finishing ration. A high degree of finish in gilts is harmful and unnecessarily expensive. Gilts intended for breeding purposes should always be allowed access to a good forage crop and should be fed a sufficient amount of grain to keep them in thrifty condition. Oats should be used liberally for growing pigs that are developed for breed-

ing purposes. The grain ration used should be supplemented with skim milk or tankage. Gilts should be developed to weigh from 200 to 250 pounds when they are bred. They should not be bred until they are eight months old so they will farrow when they are one year old.

Swine Diseases, Prevention and Control

Swine production is one of the established livestock enterprises of Idaho. The long continued production of, or the rapid increase of livestock in a locality usually is accompanied by more or less trouble with diseases. The farmer in Idaho is aware of the fact that he can make a profitable enterprise of swine production providing hog diseases do not interfere with his operations. He is, therefore, interested in knowing what the most common and most destructive swine diseases are; how they are introduced onto his farm; how he can prevent their entrance; how he can eliminate or hold in check diseases already present on the farm; and what he can do in the way of treatment for disease conditions present in his hogs.

Prevalence of Swine Diseases in Idaho

The acute infectious diseases of hogs are not generally prevalent in Idaho. Hog cholera, hog flu, swine erysipelas, infectious enteritis, and hemorrhagic septicemia occur only occasionally. Tuberculosis of the avian or fowl type is, however, quite common in practically all sections of the State.

The intestinal parasites and filth-borne diseases of swine are responsible for the greater portion of losses from disease in this State. Owing to the nature of their attack they are too often overlooked. Intestinal round worms, lung worms, coccidiosis, navel infection, necrophorus infection and other soil-borne infections associated with enteritis and diarrhea of pigs comprise the common sources of trouble.

Hog lice are very common, while hog mange is rare. The common nutritional diseases of swine such as rickets, vitamin A deficiency, goitre (hairlessness) and anemia also occur.

Swine Sanitation

The one outstanding weapon that can be economically and satisfactorily used in combating swine diseases is cleanliness in raising the pig crop.

The average swine producer is aware of the fact that little trouble is experienced in growing disease-free hogs during the first year of a swine-producing enterprise. As the grower improves the type of his swine and gains in knowledge in feeding and management during the first few years of production, he expects better pigs. However, the number of runty pigs and the amount of disease, not accounted for by hog cholera or other specific acute infections, usually increases. Either he becomes discouraged and goes out of the business, or gets additional information regarding the causes behind his failure to grow pigs successfully. Factors responsible for the loss of baby

pigs and the development of runts are numerous but can be explained on a very simple basis and can be controlled efficiently by the swine producer.

During the years between 1915 and 1925, the great hog producing areas of the Middle West were finding it practically impossible to successfully raise even 50 per cent of the pigs farrowed. On many farms, hog production was discontinued.

In 1919 under the direction of Dr. B. H. Ransom of the United States Bureau of Animal Industry, an investigation of the cause of this trouble was begun. It was found, in the first place, that most growers having such trouble were yarding their pigs in permanent hog lots. It was also found that many of the affected pigs had pneumonia or thumps and upon a post-mortem examination many immature round worms were found in the lungs. Sore mouth (stomatitis), lung worms (those worms that mature in the lung), necrotic enteritis ("necro"), and other disease conditions of a comparable nature were found associated with this round worm infestation in the lungs and intestines of pigs grown in permanent hog lots.

These findings led to the establishment of a hog-lot sanitary program participated in by a large number of swine producers. The results obtained by the use of this sanitary system were so satisfactory that it has been generally adopted. This sanitary system is very completely outlined by the Bureau of Animal Industry.[1] It emphasizes the following steps:

First, thoroughly clean the farrowing pen. Remove all loose litter and equipment and wash the house out with boiling water to which has been added 1 pound of lye to 15 gallons of water. Equipment should be washed in a similar manner.

Second, wash the sow with warm soapy water, removing all dirt from the body and feet and place her in the clean pen.

Third, keep the pigs confined to the farrowing pen if it is in the vicinity of old hog lots, until the sow and pigs are moved to a clean pasture. (Supply clean dirt daily after the pigs are five days old while they are confined to prevent anemia.)

Fourth, haul the sow and pigs to pasture to avoid picking up worm eggs from contaminated soil.

Fifth, prevent the pigs coming in contact with contaminated ground by the use of hog-tight fences.

Sixth, do not run pigs on low, wet pastures or allow them on a pasture that is being irrigated at the time.

Seventh, prevent the development of polluted areas near the feeding equipment by moving such equipment occasionally or by using feeding platforms (*Fig.* 28).

This hog-lot sanitary system is aimed primarily at the prevention of round worms but successfully controls pneumonia, bull nose, enter-

[1] *The Prevention of Round Worms in Pigs,* Leaflet Number 5, U.S. Dept. of Agriculture, Washington, D.C.

iris and other "necro" infections, lung worms, coccidiosis, and other filth-borne infections of hogs. It also assists materially in preventing the development of hog cholera, flu, and other acute infectious diseases.

Advantages of Hog Lot Sanitation

In order that growers be fully aware of the importance of sanitation in swine production, the following data from the University of Illinois,[2] are presented:

This information is based on records of 13,478 pigs raised from 1,977 sows on 154 farms in Illinois by the use of the sanitary system and compared with a large number of pigs raised in permanent hog lots on the same farms. Ninety-eight and two-tenths per cent of the pigs saved at farrowing time were raised by use of the *sanitary method.*

Large Litters Raised. An average of 1.6 to 2.7 more pigs per litter were raised. Farms formerly having the greatest trouble increased the size of litters most.

Number of Sows Needed Reduced. Twenty-eight per cent fewer sows were needed to produce the same number of pigs. Seven or eight sows under proper sanitary conditions thus raised as many pigs as 10 sows with poor sanitation.

Figure 23.—The sanitary features of the feeding platform are indispensable if hogs are to be fed for a protracted period in one place.

Almost no Runts with Sanitation. In addition to the number of pig saved by sanitation, the number of runts was reduced from 18 out of every 100 pigs to 1 out of 100 pigs. A runty pig usually is a liability.

Faster Gains by Sanitary System Pigs. The sanitary-system pigs weighed an average of 27 pounds more at 4 months of age than per-

[2] *Cheaper and more Profitable Pork Through Swine Sanitation,* Circular Number 306, University of Illinois, Urbana, Illinois.

manent hog-lot pigs. Furthermore, sanitary-system pigs reached marketable size seven weeks earlier and weighed 28 pounds more than the permanent hog-lot pigs at the time they were sold.

Preventing the Introduction of Infectious Diseases

Infectious diseases of hogs do not develop spontaneously. In order for a hog disease to develop in a herd it must first be introduced just as any weed in the garden or field must be started by first introducing some weed seed. Some swine diseases as hog cholera, develop rapidly after introduction. Others, as tuberculosis and intestinal parasites, develop slowly and may not cause great damage until they have been allowed to develop for two or three years.

Most hog diseases are introduced in the bodies of carrier animals; that is, animals that have the disease. Consequently, the introduction of affected animals from outside sources is the most common cause of new disease in a herd.

In the past, because of unfavorable crops in the Middle West, large numbers of feeder hogs have been shipped into Idaho. One northern county is reported to have lost one-half million dollars in one season from swine diseases introduced in this manner.

Such procedure is a very serious menace to the swine producing industry of Idaho. Many of these hogs have died of disease, and unknown and unsuspected numbers of parasites and disease organisms have been introduced that will continue to afflict our herds. One man shipped in 89 hogs, of which 45 died during the first month. In addition, 80 of 150 shoats already on the farm died of diseases introduced with this shipment. Round worms, lung worms, coccidiosis, and other parasites also may have been introduced. These diseases make it more difficult to grow hogs there in future years.

Federal and State sanitary officials prohibit the interstate movement of noticeably diseased animals, but they cannot be sure that many chronic diseases such as round worms, "necro," and coccidiosis are not being carried in the bodies of healthy appearing animals. Canada prohibits the importation of hogs that have been vaccinated with hog cholera virus or that come from an area affected with cholera. Development of hog cholera thus has been successfully prevented. Idaho requires that all hogs from a section where hog cholera is prevalent must be vaccinated 21 days before they are permitted to enter this State. They must also be dipped.

The swine grower should supplement these precautions by being extremely careful in regard to the source of additions to the herd even though they come from a neighboring farm. Hogs from such a farm may harbor the organisms responsible for Bang's abortion disease, round worms, or even tuberculosis without showing evidence of it. Recently several livestock auction sales yards were closed by the Director of the Idaho State Bureau of Animal Industry because of the spread of swine diseases through these yards. *If possible, only boar pigs should be introduced into a herd from outside sources,* and

they should be isolated from the herd for two weeks to be sure that some latent disease is not present.

Some diseases, such as tuberculosis and swine erysipelas may be contracted from other species of livestock on the farm. Avian or fowl tuberculosis is a very common disease of swine in Idaho and is contracted from tubercular poultry. Erysipelas may be contracted from infected sheep as may also the bovine form of tuberculosis from cattle.

Elimination of Diseases in the Herd

Every precaution should be taken to prevent the introduction of swine diseases into the herd, but much may be done in eliminating diseases already present. Animals visibly sick should be segregated immediately from the remainder of the herd to prevent the disease spreading, in case it is of a contagious nature. Most infectious diseases as well as practically all parasitic disturbances of swine are transmissible, that is, "catching." The early isolation and treatment of animals affected with cholera, flu, hemorrhagic septicemia, mange, scours, or "necro" will do much to prevent the disease spreading to other animals in the herd. The inauguration of a swine management program that provides for cleanliness in growing the young pigs will do much to prevent the development of intestinal parasites and filth-borne diseases commonly present in Idaho swine herds.

Since these diseases are of major importance to the swine grower of Idaho, a definite program must be followed to prevent their spreading to the young stock. These diseases are preventable, but are in general not amenable to treatment.

Control of Hog Diseases

Diagnosis. Diagnosis or the determination of the exact disease affecting hogs is of primary importance in deciding upon the line of treatment to be used. It is, therefore, highly desirable that the local veterinarian be called into consultation early. The opinion of other agencies such as the Federal or State livestock officials may be obtained. Your county agent will be able to assist you in getting in touch with these sources of information. Considerable information concerning the diagnosis and treatment of hog diseases may be obtained from Farmers' Bulletin No. 1244 on "Diseases, Ailments, and Abnormal Conditions of Swine," which may be obtained from the extension service of the Federal Government or from the University Extension Division, Boise or Moscow, Idaho.

Diseases such as cholera, hemorrhagic septicemia, tuberculosis, abortion, and anthrax are difficult or impossible to treat. Other diseases such as round worms, lung worms, and coccidiosis, pneumonia, poisoning, rheumatism, and filth-borne diseases are best controlled by following a rearing and management program that will prevent their development.

The swine producer should never place great faith or much confidence in treatment as a means of controlling intestinal parasites. No safe and satisfactory treatment has been developed for the control of lung worms of hogs. Furthermore, no medicine has been found to be satisfactory in the prevention and control of coccidiosis of hogs. Coccidiosis is a very common disease of young hogs in practically every hog producing locality.

Recently a pig from a herd of 200 shoats that were not doing well was received at the laboratory and on autopsy was found to harbor intestinal round worms and lung worms. It was also affected with coccidiosis. Hog-lot sanitation is the only practical solution of these conditions.

Hog Cholera. Hog cholera is an infectious herd disease of hogs. Its symptoms are high fever, loss of appetite, excessive thirst, and high death rate. If cholera is suspected, a veterinarian should be called immediately since the only known method of control is through vaccination. All pigs in contaminated areas should be vaccinated with the double treatment soon after they are weaned. Vaccination by the double treatment confers life immunity against cholera.

Hog cholera can be prevented from gaining entrance to a herd by guarding against the three main channels through which it is introduced. It is most often introduced by adding breeding stock or feeders from outside sources. About 40 per cent of the outbreaks are estimated to be initiated through the injudicious use of hog cholera virus, particularly through farmer vaccination. The third common source of infection is through pork products in garbage fed to hogs. By guarding against these main avenues of entry, hog cholera can be effectively prevented.

Medical treatment is not efficient in the treatment or control of this disease. It may be prevented by vaccination or by preventing its introduction.[1] Vaccination for hog cholera is most effective on healthy normal pigs. Swine affected with worms or other debilitating diseases often suffer heavy losses from hog cholera vaccination. Many veterinarians prefer to vaccinate some hogs with a mixed infection vaccine at the time of hog cholera vaccination.

Tuberculosis. The avian or fowl type of tuberculosis of hogs is a very mild form of the disease, most of the lesions being located in the glands of the head. The absence of bovine or cattle type of tuberculosis in hogs in this State is accounted for by the absence of this disease in cattle except in an occasional herd. Recently, at a local United States inspected packing plant the heads of 33 out of 39 hogs were condemned for human food because of infection with avian tuberculosis. In general, the farmer stands such a loss indirectly, if not directly, for no packing plant can afford such losses unless it pays less for live hogs. Hogs can be prevented from contracting avian tuberculosis by eliminating all affected chickens from the farm[2].

[1] *Hog Cholera Prevention and Control,* Farmers' Bulletin Number 834, U.S. Dept. of Agriculture, Washington, D.C.

[2] *Eradicating Tuberculosis from Poultry and Swine,* Leaflet Number 102, U.S. Dept. of Agriculture, Washington, D.C.

Hog Flu. Hog flu is a recently discovered herd disease of swine. All susceptible animals in the herd come down with the disease within a few days and become extremely sick, refusing all feed. About the time that one expects them to begin dying they make a turn for the better and all but from 2 to 5 per cent recover. At first it is often confused with hog cholera, but the low mortality soon corrects this error. Hog flu is often contracted from affected or carrier hogs at shows and fairs.

The use of mineral oil, 2 ounces for each 100 pounds of live weight as a laxative, good nursing and an alkaline mixture in the feed seems the only satisfactory treatment. The addition of 1 ounce of a mixture of equal parts of sodium hydroxide and sodium bicarbonate to each gallon of water in which the whole grains to be used are soaked and fed once daily has proved a satisfactory alkalinizind procedure.

Swine Erysipelas. Swine erysipelas is an infectious disease of swine that has recently been introduced into Idaho. It is caused by an organism or germ (*Erysipelothrix rhusiopathiae*). In the acute form it may be confused with hog cholera. In this form the affected pigs often die within 36 hours after showing sickness or they may gradually recover after passing through the chronic stage of the disease. The chronic form is often spoken of as diamond skin disease. If swine erysipelas is suspected, a veterinarian should be called promptly. The disease is commonly introduced in the bodies of carrier hogs in garbage containing pork trimmings from affected hogs, or it may be contracted from affected sheep, turkeys, field mice or pigeons. The disease may also spread from hogs to those animals or to man.

The common symptoms are sudden deaths in some pigs, followed on other pigs by diamond shaped red spots, lameness and bony enlargements of the joints, sloughing of large areas of skin on the back and unthriftiness. A diagnosis of swine erysipelas may be made by observations of the symptoms or by an agglutination test of the blood. Treatment consists of the administration of anti-swine-erysipelas-serum, which effectively controls the disease even in affected hogs within 36 hours.

Filth-Borne Diseases. Necrophorus infection and filth-borne diseases are prevalent wherever hogs have been raised extensively without following proper sanitary precautions. There is some question as to whether or not *Bacillus necrophorus* is the initial cause of all these afflictions, but it is quite definitely known that it at least plays a secondary role in their cause. This organism as well as those organisms responsible for colds and pneumonia and navel infections in young pigs, as well as infections of the glands of the head and neck, and joint infections in older pigs are the cause of extensive losses to hog growers where the hog lots are used continuously year after year. No satisfactory treatment has been discovered for these conditions. However, they are satisfactorily and easily prevented by following a sanitary program.

A recent communication from a farmer in the Camas Prairie section of northern Idaho states that of two litters of spring pigs all but three died of bull nose ("necro" of the head) and that one of three litters of 3-weeks-old fall pigs was then affected.

Navel infections that ultimately result in arthritis or joint infection as late as several weeks after birth are often fatal.

A large percentage of hogs slaughtered at the local United States inspected packing plant are affected with abscessed glands or joint infection causing a great loss of otherwise valuable meat. Many of such infected hogs die and others never become sufficiently finished to be sold for meat. These losses, though not easily seen because of the chronic nature of the diseases causing them, in the long run present one of the major leaks in the profits of the swine producer. Since these conditions do not respond to treatment, the logical procedure is to prevent them from developing by following a sanitary method of rearing. (*See Swine Sanitation, page* 51).

Infectious Necrotic Enteritis. Infectious necrotic enteritis, sometimes called ulcerative enteritis or Black scours, is a specific infectious disease of swine, commonly caused by *Salmonella suipestifer*. *Actomyces necrophorus* is a secondary invader. The common symptoms are a reduction in appetite, dark colored or watery diarrhea, and loss in weight. Affected animals either die or gradually recover.

This disease is extremely prevalent in feeder pigs shipped into Idaho from the Middle West. Swine feeders expect regularly to lose 20 to 30 per cent of all such feeder pigs. The disease often occurs following the double vaccination for hog cholera. Recently some evidence indicates that the disease is more common in the Middle West where corn is the major feed. This is believed to be the result of a deficiency of nicotinic acid in corn. Nicotinic acid is being advocated as a treatment for necrotic enteritis of swine. Other treatments regularly recommended include the use of alkalinized soaked grains and strict sanitation.

Scours, Diarrhea and Enteritis. Diarrhea or scours usually is caused by inflammation of the intestines—a condition known as enteritis. Scours may develop in baby pigs as a result of faulty feeding of the sow (*See Feeding and Management, page* 39). However, filthy and unclean farrowing pens or mud and filth on the udder of the sow are responsible for most of these cases.

Older pigs may develop bloody diarrhea or scours from an infection with coccidiosis, necrotic enteritis or worm infestations. Occasionally scours may be brought on by the pigs eating spoiled feed, poisonous plants, lye, white lead, excess salt, or other noxious material that may be taken in the feed. Most of these conditions may be prevented by following the sanitary program previously outlined and by carefully guarding the source of feed.

Most of these disease conditions are not amenable to treatment. However, some of the symptoms may be relieved by the judicious use of medication. Epsom salts at the rate of 1 ounce for each 100 pounds

of pig or the use of castor oil or raw linseed oil at the rate of 1 teaspoonful to 1 tablespoonful for very young pigs may assist in relieving scours or enteritis. In severe cases of scours or enteritis, an enteritis powder may be used very effectively. The addition to the feed twice daily of 3 ounces of a mixture containing 4 parts sodium bicarbonate, 2 parts of bismuth subnitrate and 1 part of salol for each 1,000 pounds of live weight is effective. In very young pigs a teaspoonful of this powder is used twice daily.

Round Worms. Round worms and other intestinal worms are common causes of diseases of hogs. Round worms are easily detected

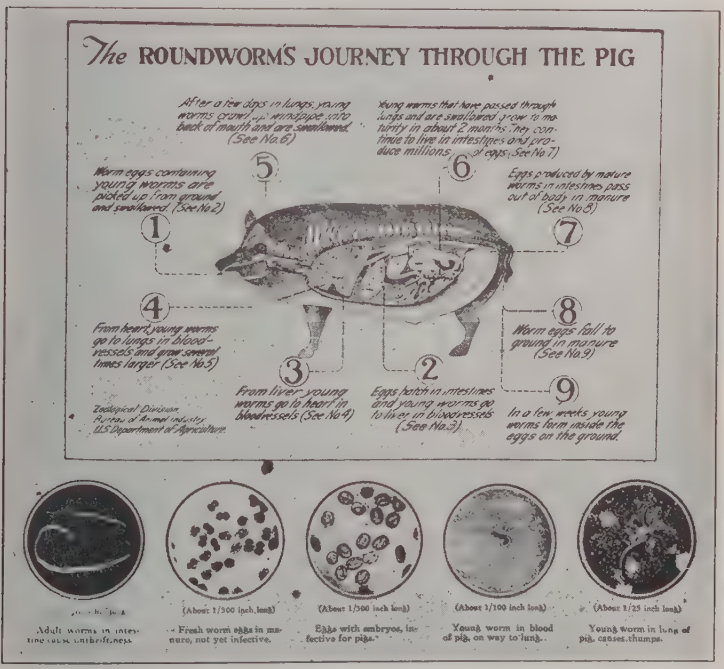
The ROUNDWORM'S JOURNEY THROUGH THE PIG
After a few days in lungs, young worms crawl up windpipe into back of mouth and are swallowed. (See No. 6)
Young worms that have passed through lungs and are swallowed grow to maturity in about 2 months. They continue to live in intestines and produce millions of eggs. (See No. 7)
Worm eggs containing young worms are picked up from ground and swallowed. (See No. 2)
Eggs produced by mature worms in intestines pass out of body in manure. (See No. 8)
From heart young worms go to lungs in blood-vessels and grow several times larger. (See No. 5)
Worm eggs fall to ground in manure. (See No. 9)
From liver young worms go to heart in blood-vessels. (See No. 4)
Eggs hatch in intestines and young worms go to liver in blood-vessels. (See No. 3)
In a few weeks young worms form inside the eggs on the ground.
Zoological Division, Bureau of Animal Industry, U.S. Department of Agriculture
(About 1/500 inch long)
(About 1/500 inch long)
(About 1/100 inch long)
(About 1/25 inch long)
Adult worms in intestine causing unthriftiness
Fresh worm eggs in manure, not yet infective.
Eggs with embryos, infective for pigs.
Young worm in blood of pig, on way to lung.
Young worm in lung of pig, causes thumps.

Figure 29.—Where Round worms are found other internal parasites and filth-borne diseases are also present. Sanitary rearing is the only permanent solution of these parasite problems. (Courtesy Bureau of Animal Industry, U. S. D. A.)

in the intestines of affected pigs as round yellowish-white worms, 8 to 12 inches long. These worms are present on practically every farm where hogs have been grown for a number of years. This worm (*Ascarsi suis*) lays as many as one hundred thousand eggs annually that pass out with the feces into the hog lot. These eggs embryonate or become infectious after one or two weeks under favorable conditions. When taken into the digestive tract of young pigs with feed or water, they hatch out, the young worms burrow through the intestine into the blood stream and pass to the lungs and other organs. They stay

there for about a week or ten days when they migrate up or are coughed up the windpipe (*trachea*) into the mouth. They are then swallowed by the pig and develop into mature worms in the small intestines. About 6 or 8 weeks is required for this process. (*Fig.* 29). A few round worms are not necessarily the sole cause of a pig becoming a runt, but the fact that a pig has round worms indicates that it has been grown under conditions which favor the development of other disease conditions such as lung worms, coccidiosis, and other filth-borne diseases, all of which are detrimental and which when combined are devastating to the health of the pig.

Several treatments for round worms have been developed. They are fairly effective in removing round worms in four to five months old pigs if they are administered carefully and to each individual separately (*Fig.* 30). These treatments are not effective against lung worms, coccidiosis, or intestinal infection commonly associated with round worms, nor do they repair the damage already done to the intestinal tract, liver and lungs of the pigs.

The most satisfactory treatment for the round worm is as follows:

1. Fast animals for 18 hours.
2. Treat with individual doses using a dose syringe.
3. Mix 1 ounce oil of chenopodium with 1 pound of castor oil or ½ pound oil of chenopodium with 1 gallon of castor oil.
4. Give 1 ounce (2 tablespoonfuls) of the mixture to 50-pound pigs and 2 ounces for 100-pound pigs. For larger animals use more castor oil up to 3 or 4 ounces, but do not increase the oil of chenopodium.

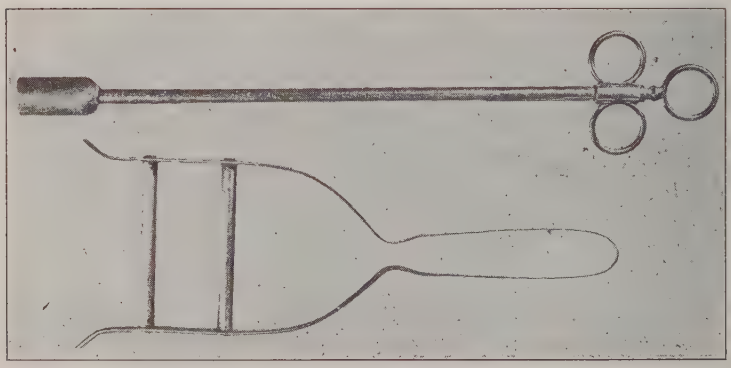

Figure 30.—Where pills or capsules are to be given hogs, the mouth speculum and balling gun are great time savers.

The use of tetra-chlorethylene in the treatment of hogs for worms is somewhat less effective than the above, but it is used quite generally. This drug is sold under trade names in 2 and 5 cubic centimeter capsules with directions. It should be given after 18 hours fasting and should be followed in 4 hours by a laxative.

The feeding of slaked coal, copperas, lye, blue vitrol or sulphur is not recommended as a means of controlling or preventing round worms in pigs. None of these substances have proved of value.

The complete prevention of worm infestation by the use of the hog-lot sanitation already suggested is the only safe and sane way to combat worms.

Coccidiosis. Coccidiosis of pigs recently has been demonstrated to be a very common disease of young and partially matured pigs. The organism responsible for this condition is not visible to the naked eye. It is found in the intestinal tract and produces irritation and even bleeding by burrowing into and rupturing the cells lining the intestine.

Coccidiosis of pigs is associated with worms and intestinal infections causing scours and dysentery of young pigs. Affected pigs have poor appetites, are small and do not grow. Many young pigs die with an acute diarrhea that may become bloody. Less severely affected pigs simply become runts or may die later from infections that gain a foothold during the attack of coccidiosis.

Coccidiosis may be diagnosed best by a microscopic examination of scrapings from the intestines of an affected pig, or less satisfactorily by examination of the feces. The practical procedure for a grower to follow in controlling this disease is to clean out the bowels with a laxative and place the affected pigs in a dry place where all fecal matter can be removed at weekly intervals. They may be shifted to a clean place on a dry pasture at weekly intervals instead, if this seems more practical.

An important point to remember in controlling these intestinal parasites and filth-borne diseases is that the organisms or eggs responsible for them are all discharged with the feces and contaminate anything with which the feces come in contact. Fecal contaminated material or environment is the bane of hog production.

Hog Lice. Hog lice occur most often back of the ears or in localities that are protected and where the skin is thin and tender. Both hog lice and hog mange can be controlled by dipping the affected animals in crude oil. Farmers' Bulletin No. 1085 of the U. S. Department of Agriculture, Washington, D. C., "Hog Lice and Hog Mange, Methods of Control and Eradication," gives methods of dipping, hand treatment and other methods of application of crude oil, old crank case oil or the use of coal tar-creosote dips in the control of lice and mange of hogs. Dipping with crude oil is the most satisfactory. Where a dipping vat is not available, hogs may be treated with a spray pump oiler. Treated hogs should not be confined too closely indoors during warm weather.

Rickets. Rickets in pigs is caused by a deficiency of calcium or other bone forming materials in the body or the absence of vitamin D, the sunshine vitamin. Pigs that are confined indoors on a ration low in calcium suffer most from this condition. Young pigs with rickets have sore feet, crooked legs and poor appetites. Such pigs occasionally have fits. Pigs that are being grown exclusively on grain

rations many times go down in the rear quarters and are "creepy." This may be a symptom of rickets or weakness of the bones. Supplying pigs with tankage, limestone or other calcium-carrying minerals together with plenty of sunshine or vitamin D supplements such as alfalfa leaves or cod liver oil, will prevent this condition. Pigs fed a ration containing liberal amounts of alfalfa or pigs on pasture do not ordinarily suffer from rickets. Rickets is common in Idaho where grains are fed exclusively. It is not common where alfalfa is produced abundantly and fed extensively to the hogs (*See Minerals, Page* 23).

Vitamin A Deficiency. Many pigs in Idaho are grown or maintained on a ration deficient in vitamin A. All of the white grains are deficient in this vitamin. This deficiency shows up in sows and boars as an unsteady gait, weakness in the hind quarters and inability to get onto their feet when down. Many sows and boars die of vitamin A deficiency annually. Very commonly, pigs from vitamin A deficient sows are weak and spraddle-legged in the rear at birth. Such pigs are very susceptible to the common infections and consequently many of them die of scours or other infections.

Recently 30 sows that were wintered on sheaf wheat farrowed an average of 10 pigs per litter but the pigs were weak at birth and the sows raised less than 3 pigs per litter.

Vitamin A is present in green growing feed, yellow corn, green forage or yellow grains (*See Vitamins, Page* 25). Sows that have access to alfalfa hay or legume pasture or that have 10 per cent of the feed mixture in the form of good alfalfa meal, will obtain a sufficiency of vitamin A. Practically all swine rations in Idaho should contain alfalfa in some form.

Goitre. Goitre (hairlessness) in pigs is caused by a deficiency of iodine in the ration of the sow during the gestation period. The deficiency of iodine which causes enlargement of the thyroid gland is evidenced by large necks on the young pigs and by the partial or practically complete absence of hair over the entire body. Such pigs, if not still-born, are weak and die soon after birth. This condition may be prevented by adding 1 ounce of potassium iodide to each 100 pounds of the salt mixture used in the ration of the sow (*See Iodine, Page* 24).

Anemia. Anemia is most often found in early-spring pigs that are farrowed in a central hog house and do not have access to feed other than the sow's milk for the first two weeks of life. Sow's milk is deficient in iron. Pigs consequently suffer from a lack of red blood cell forming material and many die of anemia before they are two weeks of age. Affected pigs are weak and extremely short of breath. They may appear in excellent flesh—even over fat. The slightest exertion causes them to thump or breathe rapidly. Less severely affected pigs become runts and many die later in life from other causes.

Anemia can be prevented by dosing the pigs with iron sulphate and copper sulphate. A mixture containing 17 parts of iron sulphate and 3 parts of copper sulphate used at the rate of 4 ounces to a quart of water may be applied to the udder of the sow twice weekly. This ap-

plication will normally supply enough iron for the suckling pigs to prevent anemia. It has been proved that the liberal feeding of clean soil or sod to young pigs confined indoors will prevent the development of anemia.

Thumps. Thumps is a symptom of some disturbance of respiration. Pigs showing this symptom breathe with difficulty, often rapidly and spasmodically. The disease most often responsible for the development of thumps is anemia (*See Anemia*). Pigs suffering from pneumonia often show the same symptoms. The common round worm is often responsible for pneumonia since it passes through the lungs in its development (*See Round Worms*). Lung worms may also be responsible for this disease.

Piles in Pigs. Piles in pigs is somewhat similar to hemeroids or piles in humans. It is a protrusion of the wall of the rectum past the natural body opening. It is brought on by any feed or condition that tends to develop constipation. It is best relieved or prevented by adding bran, alfalfa meal, or other laxative material to the ration. If the protruding bowel remains out for several days, it may be safely removed by cutting it off close to the skin with a sharp knife.

Hernia or Rupture. Umbilical and scrotal hernias are most common. The passage of the intestines through openings of the abdominal wall into sacks under the skin of the belly or into the scrotum produces a hernia. Pigs with such defects should not be used for breeding stock as these conditions are heritable. Umbilical hernias ordinarily do not need to be reduced. Scrotal hernias do need to be reduced at the time of castration to prevent the bowels from escaping when the sack is opened. This may be done by cutting through the scrotum down to the sack or tunic covering the testicle, twisting it up over the testicle until the hernia material is forced back into the abdomen. The sack is then tied off as high up as possible and the sack and testicles are removed below the ligature with a knife.

Abscesses. Abscesses may develop at any point on the body. They usually occur just under the skin and are most often seen around the jaw or along the throat. When they are headed up, that is, become soft at one point, they should be lanced and irrigated with a mild antiseptic solution.

Precautions for Use of Drugs in Feed. Where drugs are used in the feed, care should be taken to segregate the animals into comparable groups for size, age and degree of sickness, using an amount of feed that the respective groups will consume. The more vigorous and healthy hogs would otherwise obtain more feed and consequently more of the medicine, thus limiting the amount animals more seriously affected and most needing treatment would get.

Restraint of Hogs. Pass a slip loop on the end of a rope over the upper jaw back of the tusks, tighten it up and snub to a convenient post or fence. Any hog, regardless of its size, so confined will simply pull back and can be drenched or otherwise treated or handled conveniently.

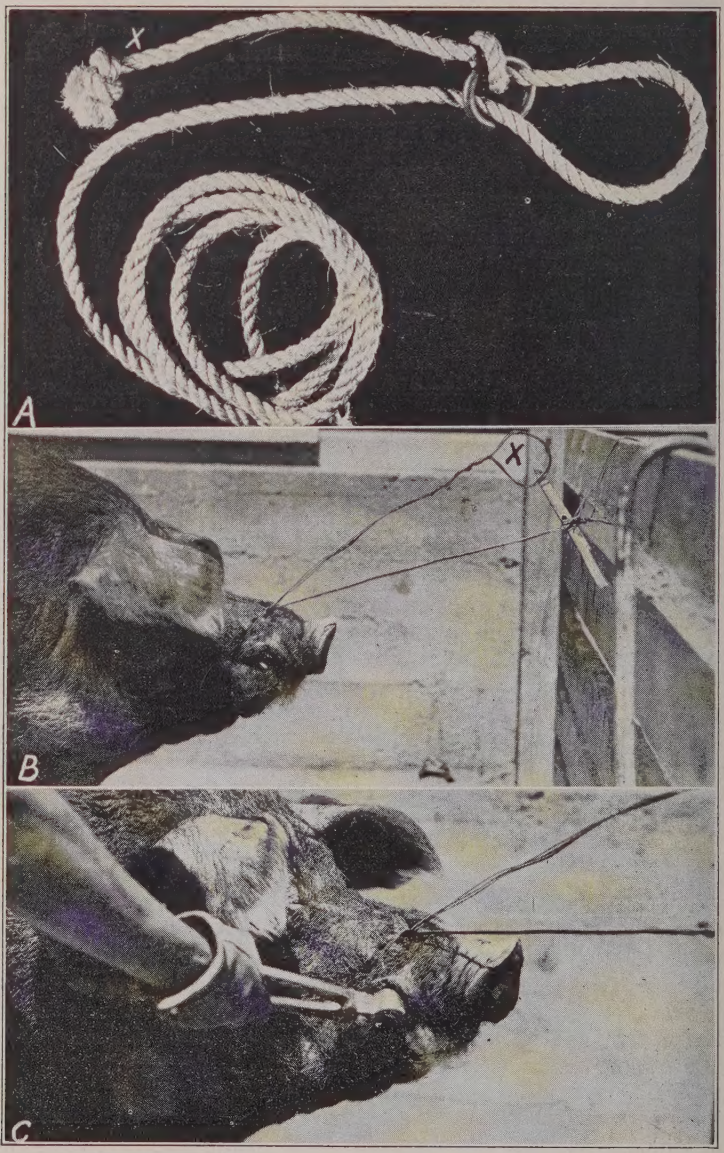

Figure 31.—Removing tusks from a boar. This is also a common method used in restraining hogs from worm treatment and vaccination. **A.** A simple rope noose for holding the boar. For removing noose pull rope end "X" after the tied end has been released. **B.** Boar in position, showing same type of noose made from three strands of wire in place of the rope. **C.** Cutting tusks with nippers.